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CONTENT

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SP-1

APPLICATION OF ENERGY EFFICIENT HIERARCHICAL BASED ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORKS FOR AGRICULTURE

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ABSTRACT

Wireless sensor networks (WSNs) are combination of distributed independent devices. It uses sensors to cooperatively monitor environmental or physical circumstance like pressure, temperature, voice, vibration, motions at different locations. Wireless sensor networks are networks in which the numbers of sensor nodes are connected to each other. They send the data to base station which is gathered from the field. Actually this data is sent to the BS in multi hop process so a number of sensors are connected and perform task. The fields of energy efficient routing protocols in the Wireless sensor networks are considered too much for doing research that's why this paper presents an overview of the hierarchical based routing protocols in the field of wireless sensor networks. In the field of WSNs the numbers of routing protocols are working. The broadly used routing protocols are clustering based routing protocol because the data is transferred from one node to another or also from one node to BS. Data is transferred in a multi hop not in a single hop. The shared nature of wireless sensors networks makes energy efficient protocol .This design is peculiarly difficult. The unique problems are self-configurable, multi-hop routing cross layer, medium access control. Network discovery design is necessary to come up about energy efficient and constant solutions. Thus cluster network will be used for measuring soil parameters such as moisture, temperature, humidity etc. All the countries realize that wireless sensor networks are most advance technology for the progress of the country in all areas. This paper particularly presents the survey on energy efficiency routing protocols in the field of agriculture using wireless sensor networks.

KEYWORDS: Routing Protocols, Multi hop routing, soil parameters, Wireless Sensor Networks etc.

INTRODUCTION

WSNs reduce the time and budget for the people work domain [17, 7, 14]. Many applications encountered by the wireless sensor networks in the field of agriculture .Embedded system process and monitor easily received atmospheric, soil conditions [9, 10].Instance of WSNs is: Monitoring system for water quality [1], Monitoring green house situations [20] etc. Wireless sensor communication has many scientific research goals derived from the minimum capability of inexpensive sensor device .long term working of sensor node is the prime necessity. The technology has been developed in the field of WSNs so the devices in WSNs field are much cheap and have low power capability. It is used in the variety of applications like health monitoring, environment monitoring, target tracking and others. The main work of the sensor networks is to sense the data in the form of analog signal from the target area then send this data to the base station for the further processing. Sending the data within the network or outside the network means to send the sensed data to the BS. Meanwhile designing of the suitable routing protocol to perform various task and these demands are useful in the various applications in WSNs. Many researchers have proposed the concept of the new routing protocols and also they are modifying the existing protocols which are used in the field of the WSNs. We can classify the routing protocol mainly in two categories in which one is network structure and another is protocol operation. These network structure based protocols are classified in different categories such as flat based, hierarchical based, and location routing. Another classification like as coherent based routing, multi path routing, negotiation routing, and query based routing and QoS -based routing. The hierarchical protocols are based upon the concept of clustering approach, in which the nodes are formed in a cluster, then the cluster head is chosen. Once cluster head is selected, we can apply the aggregation process then we can get the reduced data for further processing. Here the focus is on the hierarchical based routing protocols, because these protocols can save more energy in the form of saving more number of alive nodes after performing the rounds. There are some of the clustering based routing protocols like LEACH, PEGASIS, SOP, VGA, TEEN and APTEEN.

Wireless Sensor Networks:A wireless sensornetwork is made up of a single node .Node has capability to communicate with in a geographical area, by sensing and controlling the physical condition in the geographical area in collaboration of the other nodes. These nodes are responsible to send the fused data to the BS.

Model of wireless sensor networks:Wirelesssensor networks is comprised of the different things such as the sensor field, sensor nodes, sink, base station, internet and gateway, all connected to each to form a complete sensor networks as shown below:

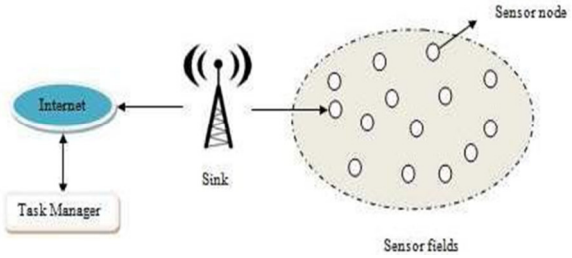

Figure1. Wireless Sensor Networks

WSNs is deployed in the particular specific area for collecting the data from the other sensor nodes, this communication occurs with the help of the satellite, blue tooth, internet and also some other mediums like radio and infrared.

Hardware components for the sensor nodes: A wireless sensor networks motes consists of a memory unit, radio transceiver, a micro-controller, power unit, power generator, sensor and Analog to digital converter (ADC) which is shown in Figure 2. The sensor node or a mote is able to gather sensed information, execute and communicate with the adjacent nodes. Free radio, spectrum allocation and worldwide availability could be obtained from sensor node by making the use of Scientific, Industrial, and Medical (ISM) band. Generally the sensor nodes are tiny in size and very less expensive. These sensor nodes have the ability to communicate with the Base Station (BS) directly and also among themselves. The sensor nodes are scattered in the fields where we monitor the physical and environmental parameters. The nodes communicating with each other need to be coordinated so that we can transfer the sensed data to BS using the multi-hop model.

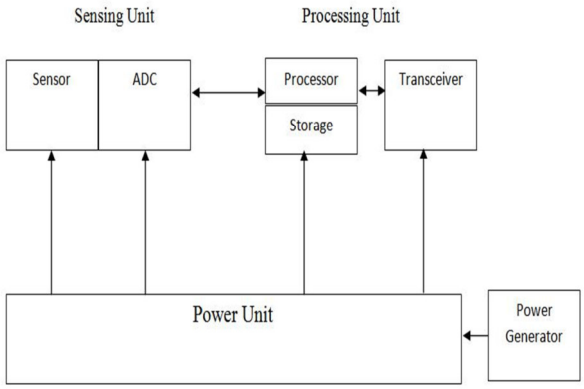

Figure 2. Which shown the Hardware component of a wireless sensor networks

Sensor nodes are operated by the battery so they have limited power availability. That's why we use protocols which are energy efficient and also use multi hop technique which can be used in the routing process.

ROUTING CHALLENGES IN THE WIRELESS SENSOR NETWORKS

Routing in the WSNs is too much typical because there are many issues, which are creating some worse factors such as unfriendly deployment conditions, repeatedly changing network topology, network failures and resource constraints at every sensor nodes in the designing of routing protocols. While implementing the routing protocols the various factors to be taken into account are listed below:

Energy consumption in wireless sensor nodes or system life time: The main goal ofthe sensor node is to transfer data from one mote to another and also to the base station in the efficient manner without compromising the accuracy of the data content. Hence many routing algorithms are used such as the shortest path algorithms but these are not appropriate. The advanced energy efficient routing protocols have been developed in which we could find the neighborhood detection of the node to send the fused data, this process is continued for another neighborhood node for sending the aggregated data.

Latency: It is the observation of the systemwithin the given delay in the protocol and it is application dependent.

Accuracy: Obtaining the accurateinformation is the desired objective from the system and accuracy is observed by the given application. Mainly there is a trade-off among accuracy, latency and energy efficiency .So the given infrastructure is of such type by which we can obtain the expected accuracy and delay with minimal energy consumption.

Fault-tolerance:Sometimes the sensornodes may fail because of physical condition of the surrounding or sometimes their energy runs out and that time it will be too much difficult to replace the existing sensor nodes so the network should be fault-tolerance. Fault-tolerance can be achieved by the data replication which requires energy, so there is a trade-off between energy efficiency and data replication.

Scalability:For WSNs the scalability is alsoa critical factor. For large network the local interactions by hierarchy and aggregation will be much critical for ensuring the scalability.

ROUTING IN WIRELESS SENSOR NETWORK

In spite of different application in WSNs, these network systems have some limitation, for instance, limited energy, limited battery power and limited communication range etc. But main design goal of WSNs is to complete the data communication while extending the lifetime and keeping the quality of communication. The designing of routing protocols in WSNs is mainly affected by some factors. Because the network has a lot of sensor designing of routing protocols issues. Therefore, we will have to consider all these features when we implement the routing protocols.

LITERATURE SURVEY

Hierarchical based routing protocols in Wireless Sensor Networks shown in below Figure 3:

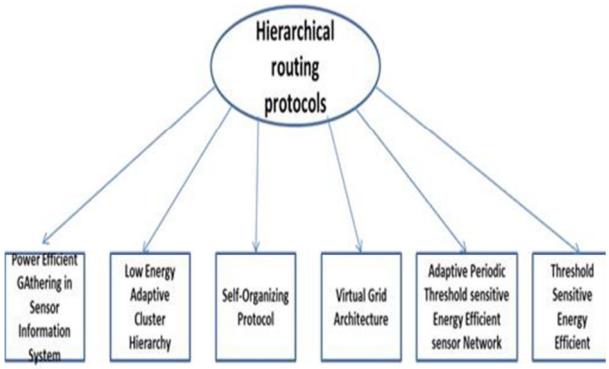

Figure 3. Shown the Hierarchical based routing protocols a wireless sensor networks

All these protocols are defined in detail as follows:

Low Energy Adaptive Clustering Hierarchy (LEACH):

LEACH is an adaptive, self-organizing clustering protocol that uses randomization of the nodes to balance the energy load. LEACH considers that all nodes initially have uniform energy dispersed, and all nodes have ability to communicate directly with the BS.LEACH make data dissemination and routing more robust and scalable. It has two rounds as shown in Figure 4 and 5.

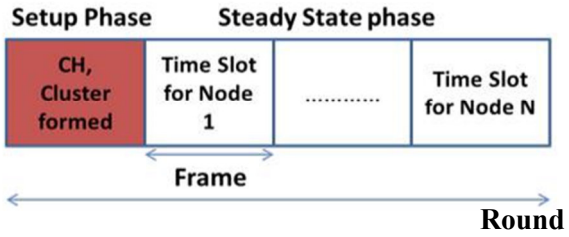

Figure: 4 shown the process of setup and steady state round.

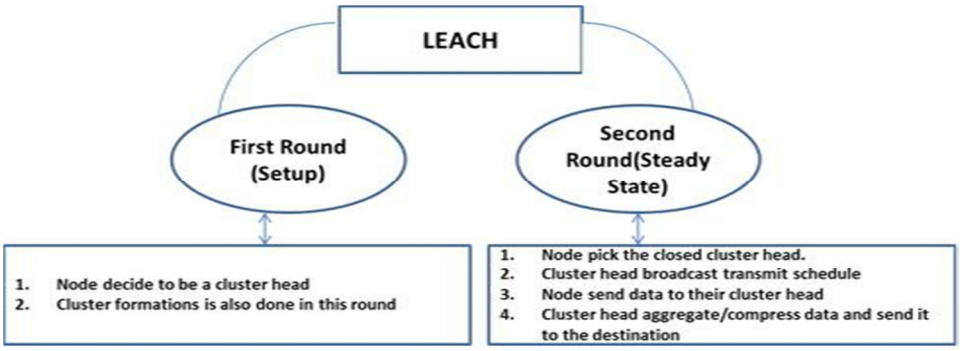

Figure 5. Shown about the uses ofsetup and steady state round.

LEACH uses the local processing to decrease the global communication and also the rotation and randomization of cluster head is done. Hence it ensures prolonged life time WSNs. But this is not applicable for the broad area networks, real load balancing and time-critical applications. Some other versions of the LEACH protocols available are:

(i) M-LEACH
(ii) N-LEACH
(iii) C-LEACH

Power Efficient GAthering in Sensor Information System (PEGASIS):

PEGASIS [1] uses a chain based algorithm to overcome the dynamic formation of cluster in TEEN and LEACH. PEGASIS considers that all the sensor nodes know the topology, and the greedy approach is used to form the chain. The sensor node which is far away from the base BS is responsible to make chain and once the chain is formed the last node which will act as leader node would be responsible to send the data to the BS. After the formation of chain, the communication of the data is done for many rounds. In the mean while if any of the node has gone in a dead state then we again use the above process and in this way the PEGASIS protocol work. But even though the PEGASIS protocol has some of the issues such as it assumes that every node can directly communicate to the BS and also the chain leader can become a bottleneck.

Self-Organizing Protocol (SOP):

Katz and Subramanian not only told about SOP but they also discuss how we can develop a systematic model of the sensor nodes applications. Based on the systematic development they have produced the infrastructural and architectural components which are needed to design sensor applications. This architecture combines the heterogeneous sensor nodes that can be both stationary and mobile. In which some sensor nodes examine the surrounding area and send the data to desired set of sensor nodes that work as routers. The nodes in the router are fixed and form the mainstay for the communication. The data which is gathered from the nodes is forwarded to the more power full sink nodes through the routers. Every sensor node should be approachable to the router node for becoming a part of the WSNs. Addressing of every node is needed in the architecture of routing; the router node identified the sensor node by address. This is connected with it. The routing design structure is hierarchical where the nodes are built and combined into the groups when these are required for supporting the Local Markov loops algorithm. Fault tolerance is used to perform a random walk in spanning tree of a graph and it is also utilized in broadcasting. The algorithm which is used for self-organizing in the router nodes and preparing the routing table has four phases and these are shown below in Figure 6:

Discovery Phase	Each sensor node discovered the neighborhood nodes.
Organization Phase	The sensor nodes are formed and combine in a hierarchy and in which the every node is allocated based on the position according to the Hierarchy. Routing tables of size O (log n) are preparing for every node. Broadcast trees that span all the nodes are designed.
Maintenance phase	The routing tables are updated and the energy levels of the nodes are made in this phase. And in which every node informs the neighbor's node about its routing table and energy level. The Local Markov loops are used to maintain broadcast trees
Self reorganization phase	In case of node failure and also for partition, group reorganizations are performed

Figure 6. Shown all the phases of routing table.

Virtual Grid Architecture (VGA): VGA is a routing protocol based on hierarchical concepts and consumes less energy for their action. The protocol uses data fusion and in the network processing for maximizing the network survival time. Although nodes are fixed still in some WSNs applications very low movement can occur, a reasonable method is to be arranged in the nodes for the fixed topology. A Global Positioning System (GPS) method is used to create clusters that are constant, equal, adjacent, and not intersect with symmetric shapes; square clusters were utilized to get a constant rectilinear virtual topology in every zone, a node is efficiently selected to become a cluster head. Data fusion is to act at local and global level. The group of cluster heads, also known as Local Aggregators (LAs), the global aggregation is performed by the subset of LAs. However, the identification of an optimal selection of global aggregation points, called Master Aggregators (MAs), is NP-hard.

Threshold Sensitive Energy Efficient Network Protocol (TEEN): This is an energyefficient hierarchical based protocol which is designed for the rapid changes in the sensed surrounding area. During the time of critical applications the response of the network must be obliging, where network works to operate in the reactive mode. The

WSNs designed structure is hierarchically grouped in the TEEN protocol. Until the sink is reached the nodes are closed to the upper level cluster. The main advantage of the TEEN protocol is in the condition where the rapid changes are taking place. On the other hand when the area is large for the networks and the number of cluster layer are less in hierarchy then the TEEN protocol consumes the considerable amounts of energy, due to long distance and when the number of layers increases, the transmission goes shorter and there exists a significant overhead in the setup phase, and also the operation of the network.

***Adaptive Periodic Threshold sensitive Energy Efficient sensor Network protocol (APTEEN)*:**APTEEN is basically anenhanced version of the TEEN protocol which is used for both time critical event and periodic sensing. Collision and no reply problem which occurs in the TEEN are reduced by this protocol. In this protocol the Time Division Multiple Access (TDMA) is applied and also every cluster is having a particular time slot, hence the collision problem can be reduced. After selecting the cluster head they broadcast a message to its neighbor which contains threshold, attributes, schedule and count time. The only problem with the APTEEN is overhead and time complexity in formation of the clusters in multilevel and developing threshold based function.

MONITORING OF AGRICULTURE USING ENERGY EFFICIENT PROTOCOL THROUGH WIRELESS SENSOR NETWORKS.

Some techniques are introduced for impressive soil parameter monitoring using WSNs but most of them focuses on calculating data only without knowing the energy efficiency of the system [2]

F. Viani, B. Majone, G. Toller, M. Salucci and E Fillppi [24] describe the deployment of WSNs for observing soil moisture at the yield of scale. In this research they have deployed the sensor node and tested it. A WSNs observation system is able to provide spatially distributed hydrological data relevant for eco-hydrological studies.

S.S. Patil, V.M Davande and J.J Mulani [33] present a system for monitoring different parameters such as soil moisture, humidity, temperature and also provide the remotely monitoring on/off facility of motors.

UB Desai [16] introduces many technical aspects of wireless sensor networks deployed and their uses in agriculture to observe and calculate infection index value which depends on crop and weather conditions. Somprakash and Yopadhyay, Siuli Roy Anurag D explains the grape vine crop monitoring system from diseases [13].

Sanchez- stated that if we want to manage long term databases then computing power should extend by increasing the number of sensors [19].

Noman Islam focuses on the analysis of demand for the agriculture domain, for doing this task he collected soil and crop data from multiple crops on single piece of land. After monitoring and simulation he provides suggestions for improvement.

M AI-Hrooby, A Gaddam,, W F Esmael [30] design a WSNs based drought monitoring system and successfully tested. Using this approach we can easily monitor different soil parameters. If data captured is different than it is easily recorded and displayed on google app to be accessed by the users all around. This approach can also help to predict future droughts, apart from identifying current drought only.

Woodward yang , Qin Wang and Mark Hempstead [11] proposed energy consumption system for wireless sensor networks nod, by using energy consumption system they were able to find out that higher limit of power efficient transmission depends on the next upper higher limit. They could also found energy efficient information transmission in WSNs. Multihop model is more power efficient than single hop if distance is long from to end.

H. chavan and P.V. karande [27] designed a zigbee based monitoring system. Working of this system is trustworthy and efficient for monitoring agriculture parameters. Wireless monitoring does not only reduce human power, it also permits user to see accurate modification in it. Wireless monitoring is low cost energy efficient technique.

Hari Balakrishnan, Wendi Rabiner Heinzelman and Joanna Kulik [6] explained wireless sensor protocol for information via negotiation (SPIN). This research proposed that nodes only transmit data when it is required otherwise it does not consume energy on unusable transmission between SPIN-I and SPIN-2

Harry Gombachika Million mafuta, Macro zennaro, Timothy Chadza and Antoine bagula [25] deployed wireless sensor networks for precision agriculture and they described how an irrigation system based on wireless sensor networks can be implemented. This paper also provides correlation between sensor nodes and RSSI in term of battery performance. It has explained that several performance parameters can be monitored cost effectively using a WSN nodes equipped with a GPRS module.The utilization of cellular network is reducing the SMS charge of remote monitoring compared to Wi-Fi and satellite communication.

Ahmed E. Kamal and Jamal N. Al-Karaki [18] focused on routing protocols for increasing the life of wireless networks without effecting data delivery and also focused on design of energy and communication .Now a days there are so

many challenges in sensor networks for increasing life. They also described merits and demerits of each routing standards.

Jim Gray+ Stuart,Alex Szalay, Andreas Terzis and Katalin Szlayecz [34] represented the first component in an end to end system by using wireless sensor networks .This system transforms raw measurements to significant data and outcome. The System also provides interface with external data sources like visualization tools, analysis, web services interface and database.

D. Timmermann, M.J handy and M. Haase have shown 2 changes of LEACH cluster head selection algorithms to increase the life of micro sensor networks by almost 30% .A significant characteristic of a LEACH network is continuity despite the modification for the deterministic choice of cluster heads. The node can self-recognize whether they can become cluster head or not. For the communication with base station the arbiter-node is not essential, the peptic's LND, FNA, HNA which describe the lifetime of a micro sensor networks have been presented.

Naser EL-Sheimy and Mohamed yourself [12] discussed wireless sensor networks intended a shift towards a modern glamour's proactive computing system .In which thousands of small computers functioning together on the users behalf. This system provides the advantages for persons and business cut technology by acquiring huge data which is beneficial in case of necessity. WSNs implementations have many challenges like hardware, human related, mechanical, software etc. If device takes less power than it can operate for long time. So we have to be careful about power management. Researchers have tried to use best networks algorithms for minimizing power consumption by WSNs.

Jie Wu and Zhao Han [28] have presented GSTB. They introduced two utmost cases of data combining and two explanation of network life time. Sensor node collected data simulated by simulator and displayed. That collected data is related to each other. GSTEB exceed TBC, PEGASIS and LEACH because general self-organized tree based routing protocol is self-organizing protocol. It balances the energy consumption because it takes small amount of energy in every round to replace the form .Data transmission is also done by the leaf-node at same time slot. So transmission slowdown is short time. GSTB extend the life time by 100% to approx 300% compared to other protocols.

W F Esmael, A Gaddam and M Al-Hrooby [30] developed and tested a draught monitoring system for a wireless sensor networks. This System monitors different kind of soil parameters. After data gathering it is connected and shown on google apps for accessing by the user from anyplace.

Anantha Chandrakasan, Wendi Rabiner and Hari bala Krishnan [4] introduced clustering based routing algorithm for LEACH. This algorithm reduces worldwide energy exploitation by spreading the load to all the sensor nodes at various points in time. Inside the cluster every node collected data and send to the head node. All gathered data finally reachs to base station. At last they simulate the data and show result. There are many advantages of using this approach.

Decrease communication energy with minimum data transmission.
The first node death in direct transmission is 8 time before the first node death in LEACH

Patel Ashish D and Patel Bhoomika D [31] describe the comparisons between all the hierarchical routing protocol used by wireless sensor networks and also analyze protocols with different parameters. All hierarchical based protocols have different parameters. All hierarchical based protocol is based on fixed network. They have shown that LEACH is better than from other protocol in terms of efficiency, security and lifetime.

E. Cayirci, I.F.Akyildiz and Y.Sankarasubramaniam [5] represent all the applications for remote sensing. The rapid deployment, flexibility, high sensing, fault tolerance are characteristics of wireless sensor networks, it opens new applications for remote sensing. In upcoming years these applications areas will make sensor networks an important part of our life. Actualization of wireless sensor networks requires fulfilling the limits presented by parameters such as hardware, cost, latency, scalability, topologies and power. So these limits are highly demanding and unique for wireless sensor networks.

Vandana and Menu [22] introduced energy efficient (PEGASIS) routing protocol to increase network efficiency of WSNs. This method is able balance energy loss among the nodes and using this method we can increase the presence of sensor nodes in WSNs. All The performances were measured by MATLAB.

Dipak Ghosal, Jennifer Yick and Biswanath Mukherjee [15] analyzed issues on various categories:

i) Inherent operating model and internal platform
ii) Communication protocol stack
iii) Readying issues and network services

They have analyzed many predefined services, algorithms, models & protocols. They proposed a new method for the enhancement of wireless sensor networks. Because many different problems have been resolved in the area of WSNs and by resolving these issues we can minimize the gap between application and technology.

Shobha k. R and Anushu introduced the system for monitoring soil moisture in the field of agriculture. This system easily operated by all the farmers because it is very easy to manage and understand .The system continuously monitored soil water level to avoid crop drying or draining out. By using this system we can increase productivity, profit and also reduce manpower.

Omveer, Dr. H. K Singh and Rishikesh Patankar [29] provided solution for agriculture system. They were able to overcome the problem of short range communication of wireless protocol which uses multi-hopped networks, Wimax, Wi-fi and GSM in wireless protocol. All These protocols are of medium range. Researchers installed the device at the farmer premises and field programmable Gate Array provides local intelligence power to device.

This device gave the result in the form of alarm and texts through local display. Finally production of agriculture has improved by using this approach.

Nataraj Urs HD and Shivaraj B [32] presented a review on Wireless sensor networks implementation of environmental monitoring, explaining how WSNs are being employed in agricultural field to measure different environmental parameters like temperature, humidity, fertility level, water level. This paper has come out with an extensive review on different WSNs architectures, documenting their methodologies, relative advantages and disadvantages. Each paper selected is different in implementation, devices used, methodology, and performance and this paper has highlighted all those aspects. By referring to the above research papers we can conclude that nowadays WSNs have become integral part of different monitoring systems especially environmental monitoring. There has been vast research on WSNs related to it topology, prototype, standards. Still more intelligent environment monitoring system can be implemented by concentrating on designing of a small size, multi- processing base station since the all above architectures have large and complex design base station. A single board base station would be a better solution for this.

The growth rate of population, changes in environmental conditions, urbanization is the primary reason for the worldwide water crisis. Report presented by united nation world water development clearly indicated that 70% of water is utilized globally for the purpose of irrigation.

Agriculture is the growing area for the development of country. By using wireless sensor networks for irrigation monitoring in agriculture better result can be obtained. It has been tested and proved that this system is resource and cost efficient with waste water saving up to 70%.There are many systems which are not providing device control decision support working for optimum irrigation scheduling. Instead of individual activities data aggregation, analysis, acquisition and decision making capability directly on the motes, the vast number of systems is developed for data transmission and acquisition of data sets, to a server system connected. Requiring big amounts of data to be wirelessly transmitted, sensor information is normally composed of the nodes and then it is processed by the central server; analysis and decision making of data organized by human is separated manually.

S.C Sharma and Santar Pal Singh [35] presented a survey on cluster based routing protocol in sensor networks. In this research authors basically focus on cluster based routing protocol merits and demerits and provide the comparative analysis between all cluster based protocol and introduced a new taxonomy of cluster based routing protocols. They also discussed that new cluster based routing method is useful for enhancement the performance of wireless sensor networks.

Mohammad Ali Hussain, Prasad Anand and B.Balaji Bhanu [26] proposed a cheap wireless system for agriculture ecosystem. This consists of many sensors nodes connected in network based computer system for storing soil information to provide remotely accessing of agriculture monitoring system. They provide better result for freshwater consumption and reduce costs of irrigation.

Cauligi S. Raghavendra and Stephanie Lindsey [2] explained that wireless technology developed the concepts of wireless communication which consist nodes those have less battery power .These nodes gathered data from specific environment. Sensing information for long time is critical situation so authors have introduced new PEGASIS protocol which is based on chain pair. This research shows that new protocol is better than LEACH. Every node transfer data to our neighbor and this strategy reduce the energy spent by node per round. They also practically proved that PEGASIS is 3 times better than from LEACH.

OBSERVATION FROM SURVEY

The food demand of the world increasing rapidly with current available land and technology .It is not possible to meet out to future requirements of food grains. Numbers of researches are going on to implement WSNs for monitoring soil parameters. Since sensors have limited energy source therefore deploying sensors in agriculture field is still not efficient cost effective.

From the given literature survey it can be seen that researchers are going on to implement WSNs for monitoring soil parameters. They are not focusing on energy- efficiency issues. Since sensors have limited energy source therefore deploying sensors in agriculture field is still not efficient cost effective. Hence we try to overcome the energy issue so

that sensors can deploy for a longer duration of time to monitor field parameters which will reduce cost of deployment, increase the life and efficiency of nodes.

CONCLUSION

Agriculture and WSNs applications present new area of research that will improve the quality of agriculture development. There are many useful applications of WSNs in agriculture like remote monitoring; real field monitoring and irrigation control. This paper has presented a survey of hierarchical based routing protocols. In this work authors have focused on different protocols and observed that in area of WSNs where energy is most important issue because WSNs nodes are operated by battery, consequently life of sensor node depends on the battery. So we want to improve the survival life and performance of sensor nodes in wireless sensor networks.

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SP-2

ANALYSIS OF MICROSTRIP MOISTURE SENSOR FOR WHEAT GRAINS: A REVIEW

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ABSTRACT

The analysis of microstrip moisture sensor is analyzed for wheat grains. The sensor can be determined with the help of CST software and determined the dielectric properties. The sensor can be fabricated on FR4 substrate which is very cheap and suitable.Theapplication of microstrip moisture sensor for sensing the moisture content of wheat as well as for the other grains.

KEYWORDS: Microstrip Antenna, Simulation Software's, Printed circuitry board (PCB),Network analyzer.

INTRODUCTION

The sensor is helpful in agricultural field and it can be determined the physical and chemical properties as well as the moisture content [1-6].

The price of rice is getting costly and due to the moisture of wheat percentage is going down so it is very important to protect the rice [7].Microwaves occupy a region in the EM spectrum that isbounded by radio waves on the side of longer wavelength and infrared waveson the side of shorter wavelengths.

The micro strip sensor was used for fish meat processing in 1970. After that it was used for ripening of fruits. Later this technique has been improved over the years, [8-10] gradually. Basically the use of sensors is to change the physical & chemical properties. A patch which is a very thin metallic strip in micro strip antenna & the function is to create a flat radiating structure on the ground plane [11-13]. The calibration equation and regression coefficient can be determined for measuring the predicted moisture content and achieves the highest regression value will be focused on the operating frequency with the good sensitivity [17].

The rice is important crop in india. Mostly, people (one-fourth) preferred in india. This is important how to protect the rice from the moisture content as well as we can't keep under the sunlight. The sensor is important for detecting the moisture in rice; moisture content provides information about the texture. When the rice will be wet then it will be crack quickly as well as not able to store in storage place. The important parameter of the microstrip antenna as a sensor such as return loss, VSWR, surface current, magnitude, phase, insertion loss, reflection coefficient. When the insertion loss will be increase then the moisture content will be increase or vice versa.

The moist sample can be determined with the resonant frequency. When the resonant frequency is decreases with the moisture level increases. It is directly proportional to moisture content. The important parameter of the sensor is insertion loss with the moisture content. When the insertion loss will be increase then the moisture content will be increases. It is also directly proportional to moisture content. The microstrip patch sensor as shown in figure 1.

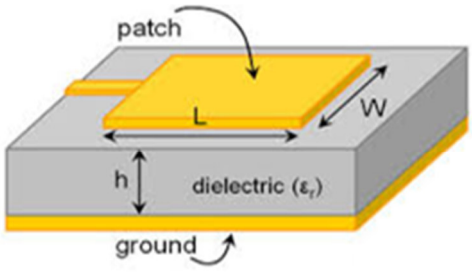

Figure1.Micro strip patch antenna

PRINCIPLE OF OPERATION

The microstrip patch sensor will be designed with ground plane, substrate and the patch. The patch can be take any shape such as circular, rectangular, elliptical etc as shown figure 2.

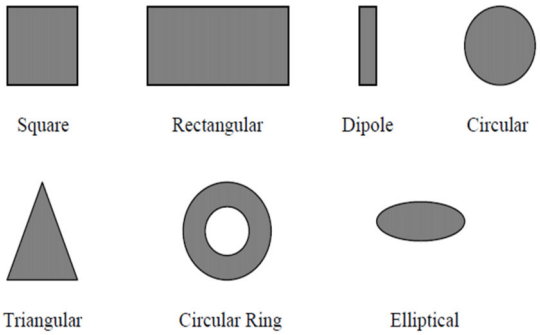

Figure 2.Shapes of sensor

The radiate fringing fields between the patch and the ground plane as shown in figure 3.

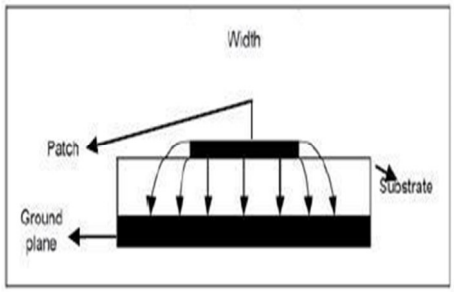

Figure 3. Electromagnetic wave fringing from the top patch into thesubstrate

The coaxial feed techniques will be used it will be very suitable due to low spurious feed radiation as shown in figure 4.

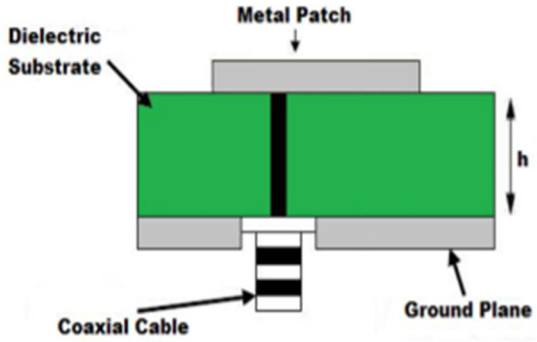

Figure 4.Coaxial feed technique

The rectangular microstrip patch sensor can be determined with the help of formulas as given below-

The effective length of the patch L_{eff} now becomes:

$$L_{eff} = L + 2L$$

For a given Resonance frequency f_0 , The effective length is given by,

$$L_{eff} = c/2f_0(\varepsilon_{reff})^{1/2}$$

The resonance frequency for any TM_{MN} mode is given by:

$$f_0 = c/2(\varepsilon_{reff})^{1/2} \quad [(m/L)^2 + (n/W)^2]^{1/2}$$

A network analyzer is used to measure the moisture content and determined the all parameters which will be very helpful as well as can be determined the return loss of dry grains and wet grains. The network analyzer is determined the magnitude and phase as shown in figure 5.

Figure 5.Network Analyzer

CONCLUSION

A low cost micro strip patch antenna can be developed as antenna sensing system i.e., which is useful for a food products as well as to detect the quality of wheat grain moisture. This can be done work on FR4 Substrate by using the Software simulation. A very interested application of microstrip patch antenna as a sensor .The simulated result shows same trend as the experimental data. The result for antenna factor of the patch antenna encourages the application of these antennas as a sensor and using the vector Network analyzer.

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SP-3

APPLICATION OF DIFFERENT PHENOLIC RESINS

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ABSTRACT

Phenolic resins are thermosetting polymers and the highest used materials worldwide.These are basically resin reinforced composites plastic materials. It works as an adhesive agent to join two metals surfaces, glass, wood, paper, rubber etc. due to its high performance and heat resistive characteristics it can be applicable in various filed like aircraft, underground water equipments, submarines, oil refinery industries, offshore oilfield and fire safety devices. Materials with similar phenolic related properties and phenolic moieties have favorable cure behaviour. Such novel phenolic resins are prepared by different polymerization method without any catalyst or by-product emissions. Many studies on modification of phenolic resin and the method developed to introduce selective functionalized nanoparticles in such resins. Later stages carbon based or Bakelite based phenolic resins are aso focused for improved functionalized behaviour of polymeric resins in various fields like membrane formation, improved tensile strength and clinical field etc.

KEYWORDS: **Phenolic resins, Polymerization**

INTRODUCTION

Polymers have infiltrated virtually every aspect of modern life. Thermosetting plastics are a class of plastics that change remarkably when heated, taking on benign chemical and physical properties. Phenolic resins are a type of thermosetting plastic utilized in engendering molds for products such as grinding wheels. The studies on modification of phenolic resin and the method developed to introduce selective functionalized nanoparticles in such resins. The phenolic resins nanocomposites are prepared for improved performance. Resins with chemical groups on the pore walls are selected specifically. The selective and controlled pore size and its distribution can help in developing sensor and membrane. The self-assembled block-copolymer template and cross linking Phenolic resin are used for developing porous films. The pore size and size distribution can be applicable in drug delivery system. The upcoming experimentation on Bakelite Phenolic resin can also prove to be a stimulating and innovative which can help in resolving environmental issues and its applications in medicinal equipment development.

PHENOLIC RESIN: COPOLYMERSAND TERPOLYMERS

Phenolic resins are the most versatile and highly useful polymers. Phenolic resins came in existence long before but upgradation continued in its development in various applications. Phenolic resins are thermosetting polymers composed of phenols with formaldehyde as monomeric units, which combine in crosslinks called as Bakelite. It was the first plastic commercially used. The basic division of phenolic resin is of two types: (a) novolacs (b) resoles. These two resins can withstand at high temperature in the range of 300° – 350° C, highly stable in water and resistive to many chemicals. It has broad range of applications in production industries such as in electric circuit board and material preparation, moulds preparation, various laboratory and space equipments development, in coatings and adhesives etc.

Sprengling *et al*[1] reported that nitrile rubbers have often been used together with phenolic resins in molding materials to produce an impact resistant product. Kosonen *et al*[2] studied pore size of the porous materials which is applicable in in various areas for example in sensors formation, membrane formation, in controlling drug release, in filters, as separators etc. The self-assembled block-copolymer template and cross linking Phenolic resin are used for developing porous films. The product obtained is pyrolysis at moderate temperature which can create porosity, control pore size and distribution, in such self assemble block copolymers, which increases its applicable in drug delivery system. The large surface area (excess of 300 m^2 g^{-1}) having greater number of phenolic hydroxyl groups at the matrix and pore walls can increase selective absorptive property.Valkama *et al*[3] Self-assembled cured composites are used where phenolic resin is modeled by a di-block copolymer to explain self-assembled hierarchical porosity. The starting composition can be post modified so that high density pores and large surface area per unit volume (500–600 m^2 g^{-1}) novel material can be obtained. In a similar manner, Gorka *et al*[4] worked on the self-assembly of polymeric carbon precursors and block copolymer template in the presence of tetraethyl orthosilicate and colloidal silica under acidic conditions to form a series of successive porous carbons. Ishida *et al*[5] reported that the benzoxazine-based phenolics. It was synthesized and found to undergo volumetric expansion which is becoming the point of interest for scientist.

The intermolecular and intramolecular hydrogen bonding is responsible for molecular packing which results in such expansion. it is proved by experimenting by substituting the different primary amine in benzoxazine monomer synthesis. Thus the results for resins are compared. High glass transition temperature (T_g) are observed for the homopolymers of this resin.

Ishida *et al*[6] studied bisphenol based curing reactions of benzoxazine precursors and aniline to determine the feasibility of reaction towards final phenolic parts. Benzoxazine precursors are the excellent heat resistance and fire and smoke properties of these resins. The novel Phenolic materials cures obtained through ring-opening mechanism do not give any by-products or any other type of side reactions. The use of raw phenol is not encouraged in such synthesis therefore, it reduces considerably the environmental and health risks for life. Zhou *et al*[7] developed a biodegradable copolymer having amino acid and polyester urea units in it. It has functionalized pendant catechol groups giving it adhesive property too. Contact angle measurements and Johnson− Kendall−Roberts method are used to find out interfacial energies of the polymeric materials. The chemical and physical properties of such copolymers can be controlled and modified by using different diols and amino acids. Since it has adhesive property it can be used for the formation of biological glues used in clinical applications.

Xia *et al*[8] reported that the phenolation of lignin- d based macromonomers like lignophenols, lignocatechol and lignocresolwith catechol or p-cresol using peroxidase-catalyzed polymerization method.to give cross-linked polymers in aqueous organic solvent mixtures. Huang *et al*[9] reported the synthesis a thermoplastic elastomers (TPE) of ethylene propylene diene terpolymer (EPDM) and nylon with excellent mechanical properties by dynamic vulcanization. The effects of the curing systems, compatibilizer, nylon content and reprocessing on the mechanical properties were investigated. This can be used as curatives.

Chauhan[10] studied the bactericidal activity of APO and its Terpolymers. It is found to posses antifungal and antibacterial property too. Mouritz *et al*[11] investigated on the effect of fire damage on the flexural properties of fibre-reinforced polymer composites. The thermal degradation and cracking of the resin matrix leads to the reduction in the flexural properties of the phenolic-based composites.Jadhao *et al*[12]studied the terploymer of 2, 2′-dihydroxybiphenyl and urea with formaldehyde synthesized via condensation method in the presence of an acid catalyst at different molar ratio. It was characterized by viscosity measurements, UV-VIS, IR, and NMR spectra.
Wang *et al*[13] investigated the inter-association equilibrium constant and interaction behavior between OH and amide group in phenolic resin/polyamide 6 blend.

Gouri *et al*[14] synthesized acrylic and maleimide based copolymers with phenolic group via free radical copolymerization. The synthesized copolymers are thermoplastic in nature. It has good mechanical and adhesive property also due to phenolic group present in the copolymer content. If the phenolic ratio is increased in the copolymer content it increases adhesive property. The maleimide content give embrittlement effect to the synthesized copolymer if molar ratio of maleimide ratio is increased.

APPLICATIONS OF PHENOLIC RESINS AND BAKELITE BASED PHENOLIC RESINS

Phenolic resins are one of the widely used industrial products. Lamination by impregnation of base materials like paper, fiberglass and cotton with phenolic resins under heat and pressure increases it's the usability in day to day applications. The thermoset polymeric matrix is formed by complete curing of resins. Paper phenolics are used in manufacturing electrical components such as punch-through boards, in household laminates, and in composite panels. Phenolic micro-balloons are used for density control. Phenol formaldehyde resin is the basic content of snooker balls as well as billiard, table-based ball games. The phenolic resin act as binding agent in brake pads, brake shoes and clutch disks, synthetic resin bond paper, etc. Phenolic resins used in plywood's because phenolic resins have no specific melting point instead it have a decomposing point in the temperature zone of 220^{o} C and above. Bakelite has its importance in prepregs. The long-term storage of glass fibre fabrics impregnated with the resin, called prepregs has some draw backs can be improved by combining with bakelites. As the temperature rises high, the prepregs get stick to one another.Therefore, Bakelite based new separating agents are used so that prepregs don't stick to one another. These novel additive or separating agents did not interfere with the bonding process of prepregs. Apart from environmental concerns, the issue of safety was also a priority.

CONCLUSION

The field of polymer has sound global impact worldwide. Thermosets copolymers and terpolymers has huge number of applications as adhesives, high temperature/heat resistive flame resistant fibers, coating, semiconductors, catalysts and cation-anion exchange resins in purification process. Due to high thermal stability, conductivity, electrical resistance and high thermal insulation, Phenolic resins and epoxy based polymers provide huge applications in industrial products. The epoxy-based materials are extensive not only include coatings, adhesives but also and composite materials such as those using carbon fiber and fiberglass reinforcements Fortunately, prepregs created from the new phenolic resin and molded into grinding wheels showed no reduction in burst resistance during extensive testing. The results of the research will be exploited commercially by Bakelite in collaboration with prepregs

manufacturers who will be able to customize the novel phenolic resin according to their individual needs for a wide variety of applications.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-4

A study on unstructured analysis in business intellegence

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ABSTRACT

The framework needed for analysis to this large amount of data must support statistical analysis and data mining. The framework should be design in such a way so that big data and traditional data can be combined, so results that come analyzing new data with the old data. Traditional tools are not sufficient to extract information those are unseen. Machine Learning approach contain algorithms based on statistic methods those are capable of analysis of big volume data in real time. The huge amount of unstructured and semi-structured data generated through information and communication technology. It gives a great impact on database designing, data analytics architecture, data warehouse implementation and effective decision making. This paper focus on different challenges and issue of text mining for business intelligence.

Keywords:- Bigdata analytics, Business intellegence, Machine learning.

INTRODUCTION

Business Intelligence (BI) indicates approaches that Accumulate, store and analyze business data that finally used to make a decision[1]. BI helps to make better decisions for an organization it involves computer-based technology for the specifying present, past and future trends of the organization. BI has an important place in decision support system, online analytical processing, business performance management and predictive analysis. BI provides competitive intelligence by taking the data of competitors. BI also helps in knowledge management that is helpful to make better strategies. BI analyze enterprise data for decision purpose but all data is not available in a structured form that is easy to understand, data also exists in the semi-structured or unstructured form that is more time taking process for interpretation. So, in this circumstance decisions making is very complex. Text mining is a technique that extracts valuable information from the large volume of unstructured text. In other word we can say that, unidentified information is derived for future predictions[2][3].

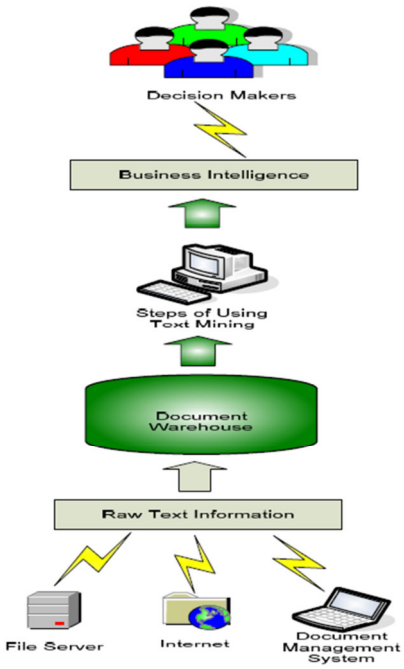

Figure 1 ***Process of Text Mining for Business Intelligence***

Text mining process indicates a system that analyzes the huge amount of text data by parsing it and find out lexical or linguistic patterns to extract correct information [4]. Text mining process looking for patterns in the text by automatic

extraction. This is a flexible technique for management of information, research, and textual data analysis and interpretation[5].

REVIEW OF LITERATURE

The term text mining indicates the process of retrieving unknown knowledge from unstructured text. Text mining is a multidisciplinary field related to information extraction, machine learning approach, analysis tools on statistics, and data mining.Text mining contains some step that involves preprocessing of documents,classification process, clustering on the basis of the feature, information retrieval and finally, visualization. In 2011 structured and unstructured data analyze individually and collectively. They provide the comparison between text mining and natural language processing to discover knowledge in documents (Gharehchopogh et al., 2011). An approach present for knowledge extraction this approach is based on Markov logic. This system was use ontological constraints, confidence values and human labeled data for patterns extraction (Jiang, 2012). An interface is designed in text mining process. This interface is based on trial and error concept. In text mining user interface is used to explore the text (Otsuka et al.,2013). A sentiment analysis algorithm proposes that can apply to a real time platform. In this approach, they optimize data structure, query strategy and parallel processing. They produced results regarding efficiency and accuracy of their approach and other existing methods (Zhao et al., 2013). TETDM system was developed It provides an environment where many text analysis tools can be combined. It is design with the aim to support for mining information from large volume of text data (Sunayama et al.,2014). An approach that describe feature of process and offer a methodology that is based on searching task and inventive knowledge work. This is considering user exploration process, reflection on the searching task and learning to use the system as requirements (Otsuka,2014). An algorithm that was the combination of classical partitioning algorithms and probabilistic models. The principle behind the algorithm was using the side information that is available with the text documents in mining process (Aggarwal et al., 2014). Specify the use of data, text and web mining for decision support. They describe Mini-track system for managerial decision making (Delen et al., 2014). Agile text has shortest cycles, the frequent redefinition of the task and uninterrupted performance monitoring. They introduce a system Sherlok that supports in the fast development of agile text mining applications (Richardet et al.,2015). BI system based on R-project.in their experiment they use 35 papers of business intelligence and analyze them (Ishikiriyama et al.,2015). Supervised machine learning algorithms for stakeholder opinion mining approach offer stakeholder concern extraction and stakeholder concern classification (Xuan et al.,2016). After that, a method proposed to find out the product chance in the market by comparing target firm's internal capabilities. They did it by accessing product data by applying text mining method then create relationship rule for the product.Text Mining refer to extract the relevant information from text. Following table specify some important work done recently in text mining.

CONCLUSION

This paper provided a brief introduction to text data mining for business intelligence. Businesses need quick decision for improvement of their business process. The data that can make effect on business process are coming from different sources and mostly in text form. So effective text mining technique is required. There are so many challenges and issues involve with text mining while extracting information from text.

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SP-5

CIRCULAR MICROSTRIP MOISTURE SENSOR BASED ON OVEN DRYING TECHNIQUE: A Review

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ABSTRACT

A sensor can be designed with the shape of circular and used the coaxial feed techniques because of low spurious feed radiation with the help of CST software and moisture can be detected by the vector network analyzer. The dielectric properties are important parameter of moisture content. It can be determined the moisture with accuracy.

KEYWORDS: Circular microstrip patch Antenna, CST Software, Printed circuitry board (PCB),Vector network analyzer.

INTRODUCTION

The superiority of rice grains brings on a high demand in the India as well as especially in Asia [1-4]. The price of rice is getting costly and due to the moisture of rice percentage is going down so it is very important to protect the rice. The Various techniques have been designed for detecting the moisture content of rice [5-7]. An annular photoelectric sensor was also used to determine moisture content of rice grain by applying the Lambert's law.

Recently, microstrip antennas have been widely used in many applications such as communications, medical and agriculture [8-12]. Now days microstrip antenna is using as a sensor for determined the moisture content. The moisture will be present in the food or grains then more chances of damage. The security of food will be possible by microstrip moisture sensor.

The objective is to establish the relationship between reflection coefficient of the sensor and moisture content in rice grain [13-15]. When the reflection coefficient will be increase then increase the moisture content. The important parameter of the sensor is dielectric properties which is useful for determining the moisture content. The circular microstrip patch sensor as shown in figure 1.

The sensor is very useful in agricultural field and it can be measured by the vector network analyzer as well as dielectric properties are important parameter of sensor such as dielectric constant and loss tangent. The loss tangent is always inversely proportional to moisture contentat the selected frequencies. It is always lower than 1. The dielectric property is always equal to the differences of dielectric constant and the loss factor.

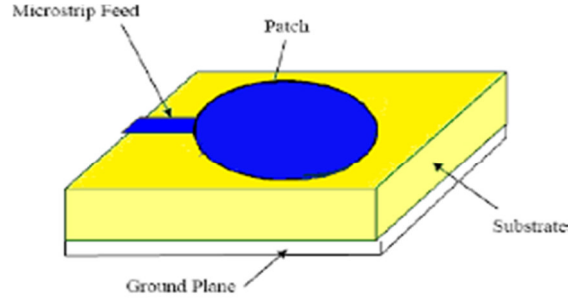

Figure 1. Circular microstrip moisture sensor

MATERIAL AND METHOD

The sensor will be designed with using FR4 (lossy) substrate with ε_r = 4.3 permittivity and h= 1.6mm thickness. A 50 ohm SMA female connector will be used as the feeding port of the microstrip on the fabrication and measuring time.

The samples is prepared by using the standard an oven drying method for the rice grain samples, but normally can be find out the moisture content 30%-40% approximately on wet basis. But actual find the moisture content can be determined by using standard an oven drying method, which is helpful to determined the moisture content easily and less time consume.

The dielectric properties is completely depend on the moisture content when the dielectric constant will increases then the moisture content will be increases same as for the loss tangent related to moisture content.

Moisture content (%) = {mass of water / dry mass of sample}*100% **(1)**

MEASUREMENT OF SENSOR CHARACTERISTICS

The sensor will be designed with the help of CST software and characterised by the different parameters which is useful to fabricate the sensor like gain, magnitude of S-parameter, phase, etc. The experimental procedure to find the parameters of the antenna is discussed in the following sections. The S parameters can be determined with Vector Network Analyzer and radiation patterns can be computed through the antenna measurement setup in connection with Network analyzer. When the port are connected in sensor there will be generated few losses at different frequencies. The calibration equation will be generated as well as regression value will be determined at suitable frequency.

a) Return loss and VSWR

The return loss is the important parameter of sensor to analyze the sensor will be worked proper or not. It is defined the ratio of the reflected voltage to incident voltage, when the reflected voltage will increase then the incident voltage will be decrease and vice-versa. When the sensor is connected to the vector network analyzer then it can be described the return loss as well as all the parameters of the sensor. It is the measure of the impedance mismatch between the antenna and the source line. The degree of mismatch is usually described in terms of Return loss or VSWR. The return loss (RL) is the ratio of the reflected power to the incident power, expressed in dB as-

$$RL = -20\log(|\Gamma|) = -20\log(|S_{11}|) = -|S_{11}| \text{ (dB)} \quad \textbf{(2)}$$

The frequency corresponding to return loss minimum is taken as resonant frequency of the antenna. The range of frequencies for which the return loss value is less than 10 dB points is usually treated as bandwidth of the antenna. The bandwidth of the antenna can be expressed as percent of bandwidth.

$$\% \text{ Bandwidth} = \frac{Bandwith}{Centrefrequency} * 100 \quad \textbf{(3)}$$

The voltage standing wave ratio (VSWR) is the ratio of the voltage maximum to the minimum of the standing wave existing on the antenna input terminals. VSWR equals to 2 gives a return loss of approximately equals to 10 dB and it is set as the reasonable limits for a matched antenna. When simulate the sensor design on CST software the the return loss should be decrease as well as VSWR should be 2, so it can be fabricated the sensor.

b) Efficiency

The radiation efficiency of the antenna can be defined as the ratio of the radiated power to the input power. It can be expressed in terms of Q factor, which for a microstrip patch antenna is-

$$e = \frac{Q_t}{Q_{rad}} \quad \textbf{(4)}$$

CONCLUSION

The analyzed the circular microstrip moisture sensor will be low cost and reliable with the help of oven drying technique. Moreover, the single grain such as rice, wheat etc and measurement does not depend on the bulk density. In this study, moisture and dielectric models can be created to suit the studied coaxial probe. This can be done work on FR4 Substrate by using the CST software simulation. Results are analysed with the help of CST software as well as analyzed all the parameters of sensor. Theoretical survey on microstrip patch sensor has done. In future the circular microstrip moisture sensor can be designed and determined the variations between the reflection coefficient ant moisture content.

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SP-6

PROBLEMS IN USING CARBON NANO TUBES (CNT) IN CEMENT CONCRETE INDUSTRY: AN OVERVIEW

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ABSTRACT

Engineering properties of cement and concrete have always been important for all civil engineers and architects. All properties; Durability, tensile strength, impact resistance, modulus of elasticity, strain capacity are important. Nano technology is providing new opportunities in every field also contributing in cement concrete technology. Carbon nano-tube is new interesting material which has attracted many researchers attention due to its strength and light weight. But its availability at normal cost and its purity is still a hurdle for its use in construction. There are so many other factors which affect the use of carbon nanotube in construction. CNT available in two forms single wall CNT and multi walled CNT, having much difference in properties. Mechanical properties depends upon the structure of the CNT used and the bonding of the molecules of carbon atoms. Mixing technique of CNT into cement is also important because there are lot of variations in strength due to improper mixing and non-Uniform dispersion. CNT helps as reinforcing material into cement and acts as crack bridging material. It can also work as sensor of monitoring health of civil engineering structures. Cost effectiveness and environmental impact of CNT are still matter of investigation. Mixing rate may vary from 0.1% to 0.2%. The other admixtures like surfactant or super plasticizers plays key role in dispersion of CNT. It is reported that CNT-Cement composite have improved compressive and flexural strength up to 60 % comparative to OPC.

KEY WORDS:CNT, Multiwalled carbon nanotube (MWCNT), dispersion, flexural strength.

INTRODUCTION

Construction industry which is the largest industry in the world needs new kind of high strength materials with enhanced engineering properties like more durability, more flexural [20] and compressive strength, chemical resistance. Now Nano-technology has changed our way of thinking, our expectations, and methodology of producing new products. Incorporation of Nanotechnology has given us new way in development of new composites and materials . By adding a small amount of nano material into bulk quantity of other materials, we Get new nano-composite materials.

Nano technology is the science of using the materials at nano scale that is at size of 10^{-9} m. Any material which has particle at least one dimension between 1-100 nm called nano material. At that nano scale the properties of the same material changes tremendously. There may be two reasons for this change (i) Because at this small scale the gravity forces becomes negligible compare to electrostatic forces, and quantum effect become dominating, (ii) the surface area increases tremendously due to fineness , so the reactive area , bonding surface increases too much. Nano technology may be defined as the thinking, planning, designing, proportioning, and producing the products at nano size and shape. Our gadgets becoming tiny by use of nano science. Nano science has given us new vision. For Engineers and scientists nano science providing new world of high performance, smart, and strong materials [3].

HISTORY OF CNT EVOLUTION:

CNT first discovered in Russia. CNT is the C60 molecule first identified in 1980 with name fullerenes. It is cage like structure in cylindrical shape and spherical shape with few nano-meter diameter. Carbon atoms are arranged in hexagonal and pentagonal pattern. In 1991 Ijima synthesise it .Carbon to Carbon bonding in CNT is very strong. It is found that CNT Young's modulus and strength is 5-10 times greater than steel and it is lighter than steel. It has elastic strain capacity up to 10-12% which is about 50-60 times of steel. Carbon nano tubes (CNT) and carbon nano fibers (CNF) are used to make new composites because both are very strong, and posses very good tensile strength and Young's modulus and high stiffness.CNT has very high aspect ratio, [12,13,14,15] therefore engineers and scientists

are composing it with different materials and making new strong composite materials[22]. In civil engineering CNT used with cement and concrete to produce new strong composite [11-20].

How CNT affects cement concrete property:CNT with cement and cement concrete has been tried by many researchers and found the results encouraging regarding compressive and tensile strength. The crack resistance is improved too much as CNT and its fibbers act as bridging component. Cracks are arrested at micro level so the propagation of cracks restricted. Similarly shrinkage cracks and permeability for moisture reduced [23].It improves the durability, ductility also which is most desirable in concrete. By adding 0.1% to 0.2% of CNT the researchers have found the increment in compressive strength up to 10% to 30 % and in flexural strength up to 20-50%, after 28 days curing. These results show that the use of CNT in cement concrete is very promising.[3-6]

Some practical problems in using CNT-cement composite as construction material.

(i)Purity of CNT: Making CNT is challenging process, its properties depends on its constitution of atomic structure, its chiral angles, which is different for zigzag and armed chair types of CNT. The purity of carbon nano-tube produced is very important, because at the time of production some other metallic oxides remains as impurity. There are three popular methods to synthesis the CNT those are (1) Chemical Vapour Deposition method (CVD), (2) Arc-Discharge method and (3) Laser Ablation method.[8-12]. It's homogeneousness is uncertain and therefore the experimental results in different engineering tests are inconsistent. Similarly the mechanical properties of single walled carbon nanotubes and multi-walled carbon nano-tubes are very different. In multi-walled carbon nanotubes the no. of walls may vary from 3 to15. Therefore to get CNT of a unique properties is difficult[13-15].

(ii) Need of Higher technology to observe and understand structure and its mechanism:To understand the mechanical strength and bonding structure of CNT-cement composite or nano materials, we have to go for higher technologies for characterization of material such as scanning electron microscopy (SEM), atomic force microscopy (AFM), transmission electron microscopy (TEM), X-ray diffraction method (XRD) etc.Hence by adding it in any other material, the effect of compound material on engineering properties is not easily confirmed.[20]

(iii) Non uniform dispersion of nano composites in water or cement matrix : Uniform dispersion of carbon nano tube CNT and carbon nano fibre CNF is a big problem. Due to high 'surface area to volume' ratio ,under the effect of Vander Waals forces CNT and carbon nano fibers attracts each other and the bundles of CNT are formed which are very difficult to separate. To overcome this problem various efforts are required. (i) Sonication (sonication is mixing technique in which acoustical energy is used for uniform dispersion and remove the agglomerations of CNT) [18]and (ii) adding super plasticizers or surfactants (admixture to reduce water content and to increase workability of cement-concrete) are required. For mixing uniformly into matrix this extra effort has to be applied. If large amount of surfactant (poly caboxylate based admixture) is mixed than it creates problem in hydration process of the cement. (It retards the hydration process of cement)[16-19].

(iv) Cost of CNT-cement composite:Cost ofproduction of CNT-cement in construction is very high. Its cost should be reasonable because huge amount of cement is required in every construction. At present it is very costly, its price should be not much higher than the cost of cement. According a report in 1992 the CNT cost was around 27000 dollars per pound, which was reduced in 2006 around 550 dollars per pound and in 2011 it was 120 dollars per pound. Still it is too much costly. it is reported that in united states in 2006 business of nano material was in range of 20 million dollars and in 2011 it was 100 million dollars and it is estimated that in 2025 it would be 175 million dollars .Major problem in using CNT in construction is it's cost. Challenges are there to produce it economically to use nano-cement product in construction[9].

(v)Uncertainty about its impact on Health: **U**se of Nano materials in construction is quite new and its long life effects are not well define. The effect of nano material on human being is still uncertain. The nano particles are so fine that they can enter via any medium such as breathing, or via skin to our blood or brain hence precautionary measures are necessary. The detailed investigations are under progress by scientific and researchers [11].

Other Nano materials applications in cement concrete

Some other nano materials which are being used in construction are; nano silica [6], nano alumina (n-Al_2O_3), nano zinc oxide (n-ZnO), nano titanium oxide (n-TiO_2), nano calcium carbonate (n-$CaCO_3$). TiO_2 is used in self cleaning glasses due to its hydrophobic property. So many types of nano composed materials are available in the market; Scratch resistant, UV resistant, Stain resistant, Odour resistant. When Nano silica is used in cement concrete it improves impermeability and decreases setting time and strength of concrete. Nano-alumina increases the flexural strength up to some percentage. The use of ZnO in cement concrete improves the processing time. Nano-polymers have been used for light weight concrete with good insulating properties [1].

CNT is not inert material as other components of cement concrete used in construction; it is good conductor of electricity and heat hence can be use as sensor in buildings. It is reported that CNT conductivity is eight times of copper wires. That is why it can be used in film of cells. These days in smart buildings some materials are used as thermal sensors for automatic control of inside temperatures, and some researchers are using smart materials for health monitoring of buildings which can sense the strain deformations and can detect even micro cracks and CNT is one of the best material for this purpose [9-11].

CONCLUSION

Use of nano materials not only increases the mechanical properties (compressive strength and tensile strength) of the composite material, but also increasing life of the product by increasing durability by enhancing its resistance to corrosion, abrasion, impact resistance, fatigue resistance etc. In this manner it is saving energy and cost of repair. Although CNT provides us new promising alternatives in terms of new cement composites, but investigations are still required for long term impact. Nano technology giving solutions to our engineering properties related problems. Durability and chemical resistance of construction materials is enhanced. But nano materials may have some health hazard problem, because the nano particles may easily enter in the body of occupants through breath, skin etc hence more investigations are required. Costly production of CNT-cement composites is also one of the constraints. Its purity and homogeneousness is also a issue to ascertain its consistency in its engineering properties. However the laboratory results are encouraging. In use of CNT mixing with water, extra efforts for sonication and adding super plasticizer are required. In sonication and super plasticizers additional cost, extra care, time required. Some of the evidences produced by researchers have been discussed in this paper but this discussion is always open ended and always have a scope for future discussion.

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SP-7

ANALYSIS OF DURABILITY OF RICE GRAINS BASED ON ERH TECHNIQUE

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ABSTRACT

The sensor is very important to detect the moisture content and can be designed to detect the moisture with the help of different technique; it will be detect the storage rice, how much moisture in the storage rice as well as detect the quality of rice, but the ERH (equilibrium relative humidity) technique is used to measure the moisture content of rice. This technique is useful to others because of easy to install with accuracy.The proposed sensor will be used to measure the moisture content of the grains with the help of equilibrium relative humidity technique [ERH], which will be more usable as well as moisture content can be calculated by the equilibrium moisture content model.

KEYWORDS:Rice, Equilibrium Relative Humidity (ERH), Moisture Content, Sensors.

INTRODUCTION

Rice is the important food crops in the world. It supplies more than 28% of calories to the human beings. This is important to keep the rice in proper storage place if the moisture will be increase then the rice will be damaged or the insects will be damaged to the rice. The ERH technique is very important to find the moisture content.

When the rice keep in storage place, it can detect the moisture or humidity in the storage place, it can also be detected the quality of rice. This sensor is very useful for the industries as well as farmers can be used easily. The temperature sensor will be set on the wall near the number of rice bags then the signal will be transmit to cluster of wireless then the signal will be transfer to humidity sensor, central sensor then EMC calculation will be done by the EMC equation, after calculation it will be transmit the signal to the transmitter and the receiver, finally message will be received in mobile.

The sensor process is very easy and now a day's mobile is very important in our life, so in this process will be used the mobile technology. GSM Mobile technology forms the core part of the proposed system. The user has a mobile GSM device where the data that is gathered from the sensors in the sacks of rice are formulated and sent. Initially, all the rice sacks are numberedand the humidity sensors are place at 3 different levels in a single rice sack. The Temperature of the room is taken as a constant value.According to the humid state, the mobile application provides remedy measures for a good durability of rice grains.

ERH TECHNIQUE

It is the ratio of the partial pressure of water vapour(PH_2O) to the equilibrium vapour pressure of the water (P^*H_2O) that is called the relative humidity RH or ∅.The equilibrium vapour pressure of the water PH_2O at a given temperature is given as:

$$\emptyset = \frac{PH_2O}{P^*H_2O} \qquad (1)$$

Where,

PH_2O =partial pressure of water vapour
P^*H_2O = equilibrium vapour pressure of the water
RH or ∅ =relative humidity

From eq (1), it is clear that when the partial pressure of water vapour will be increase then the equilibrium vapour pressure of the water decrease as well as humidity will be increase and vice-versa.
It can be determined in percentage, when the moisture will be more then relative humidity will be higher and in the other hand moisture content will be decrease then the relative humidity will be decrease. The ERH technique detects the moisture content at a constant temperature; the next ERH value will be taking to change the temperature and so on. It can be determined with the help of EMC equation. The basic flow diagram of the system as shown in figure 1.

The grains should be keeping at a particular temperature then no chances for destroying, some grains are in table 1, and they should not to be kept higher than moisture content.

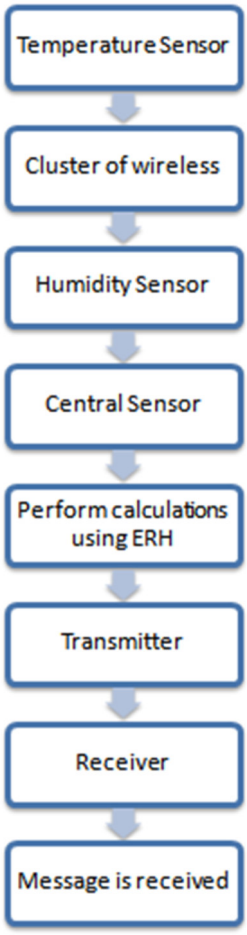

Figure1.Basic Flow Diagram of the system

Table1 Moisture contents of various crops

Paddy	15%
Rice, Maize, Wheat, Sorghm	13%
Millet	16%
Cowpeas, Beans	15%
Groundnuts, Cocoabeans	7%

CONCLUSION

In this paper analysis the moisture content of rice with the help of ERH technique. This technique is easy as well as accuracy and the calibration equation can be established with the help of EMC equation. The ERH technique will be worked at the constant temperature. After 10 minutes change the temperature then other value will be noted. So, this process is very easy to measure the moisture content. This technique is very low cost and farmers can be used easily.

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SP-8

DETERMINATION OF MOISTURE CONTENT BY USING THE MICROSTRIP ANTENNA WITH THE HELP OF DIFFERENT TECHNIQUES: A REVIEW

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ABSTRACT

The microstrip moisture sensor is very useful for measuring the moisture of rice, wheat, soil, etc. It can be measured at different frequencies with the help of different techniques. The coaxial feed techniques will be used for designing the microstip antenna it is very easy to feed and low spurious feed radiation and measured by the vector network analyzer and discussed the all techniques related to moisture content.

KEYWORDS: Microstrip antenna, moisture content, CST, vector network analyzer.

INTRODUCTION

Agricultural biomaterials are materials consisting of organic and inorganic inclusions along with water [1-4]. Oil seeds form a major constituent of the agricultural and food sector. The agricultural application of microwaves, particularly crop growth studies like classification, mapping of various crops, monitoring of crop growth parameters, leaf area index, moisture content, dry matter production are very important aspect [5-9].

At microwave frequencies, dielectric properties of bio vegetation are primarily a function of frequency, water saturation, porosity, texture, component geometry and electrochemical interactions [10-13]. Much of the simplicity introduced by symmetry is lost inpractice because of fringing fields and associated frequency dependentreactance between the arms of the bridge for comparing transmitted waves. Atthe single frequency, the symmetry may be restored by means of appropriatematching devices.Microwave techniques and instrumentation can be utilized in agriculture to improve the efficiency of the crop production, handling and processing, and improve the quality of the products. The return loss and VSWR is the important parameter of antenna for fabricated. The empirical equation can be used to determine the moisture content in terms of dielectric properties i.e., dielectric contanst and dielectric loss factor.

Dielectric properties of agricultural materials and products are useful in increasing numbers of applications, as new technology is adopted for use in agriculture and related industries [14-16]. Measuring and controlling moisture content is an important aspect in the harvesting, storage marketing and processing of oil seeds [17-19]. The use of dielectric properties for measuring the moisture content of products such as cereal grains has produced a variety of methods using the RF range of electromagnetic radiation. The coaxial line fed as shown in figure 1

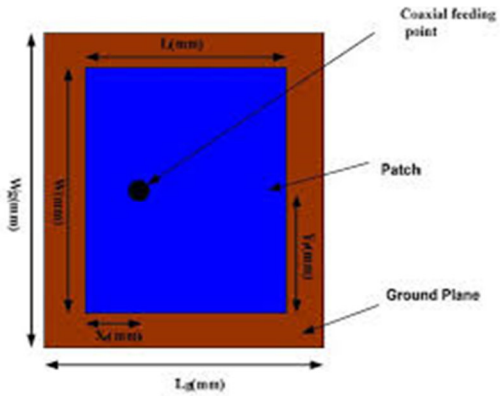


Figure1. Coaxial feed

TECHNIQUES FOR MICROWAVE MEASUREMENTS

Microwaves play an ever increasing role in modern life. The electromagnetic spectrum from 300MHz to 300GHz is called the microwave spectrum. This corresponds to the range of wavelength from 30 cm to 0.3 mm in the free space. Microwaves occupy a region in the EM spectrum that is bounded by radio waves on the side of longer wavelength and infrared waves on the side of shorter wavelengths.

At microwave frequencies, different measurement techniques can be used.

- Oven drying technique
- Dielectric Resonance Technique
- Slotted line and Double minima method

All these methods fall into two categories: either destructive methods in which sample preparation is needed for accurate evaluation or non destructive methods which require very little or no sample preparation. In all these methods the measured quantity enables the computation of its permittivity.

a. Oven Drying Method

The actual moisture content is determined using standard an oven drying method.

$$\text{Moisture content (\%)} = \frac{\text{Mass of water}}{\text{Dry mass of sample}} * 100$$

$$\text{Moisture Content (\%)} = \frac{m_w}{m_d} * 100 = \left\{\frac{m_m - m_d}{m_d}\right\} * 100$$

Here, m_m is the total mass of the unit volume of the medium (i.e. $m_m = m_d + m_w$).

b. Dielectric Resonance Technique

In this technique, the dielectric sample is placed between metal shields and the transmission (S21) and/or reflection (S11) measured as shown in figure 2 and 3.

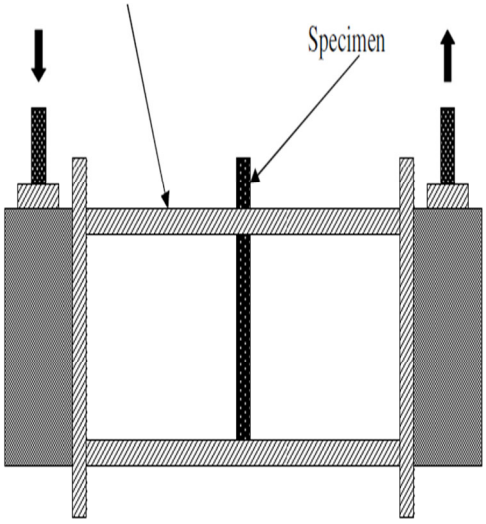


Figure 2. TE cavity perturbation technique

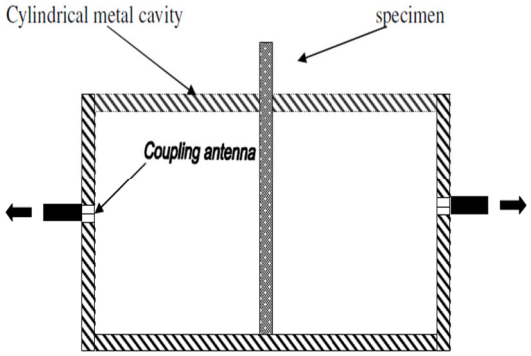


Figure 3. TM cavity perturbation technique

c. Slotted line and Double minima method

i. Slotted line

The electromagnetic field at any point of a transmission line may be considered as the sum of two travelling waves as shown in figure 4.

The ratio of the amplitude of the maximum to the minimum field strength of the wave is called the standing wave ratio, or more generally, voltage standing wave ratio (VSWR), and is given by,

$$VSWR = Emax / Emin$$
$$VSWR = (E_1+E_2) / (E_1- E_2) = (1+E_1 / E_2 / 1- E_2 / E1)$$

Where,

E1 and E2 are respectively the amplitude of the incident and reflected electric field strength.

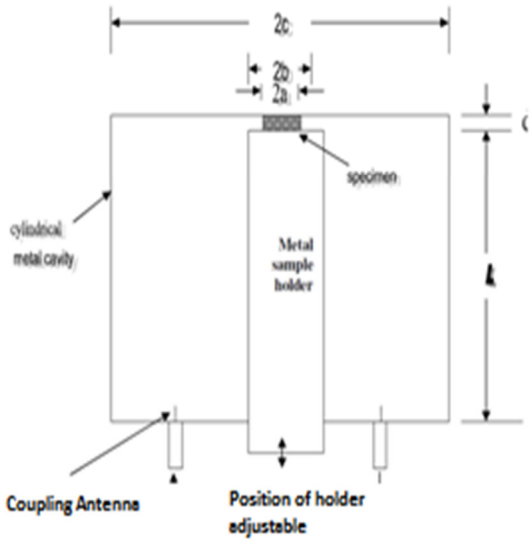


Figure 4.Re-entrant cavity perturbation technique

ii. Double minima method

Accurate measurement of VSWR greater than1 can be made using the double minima method. The variation of square law detector output, i.e. amplitude square of the standing wave along the slotted section. The coaxial line setup as shown in figure 5.

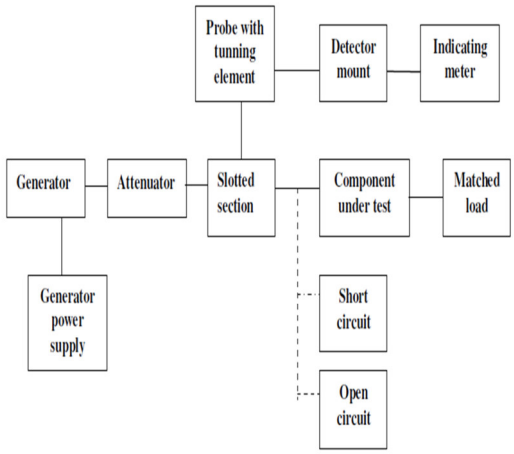
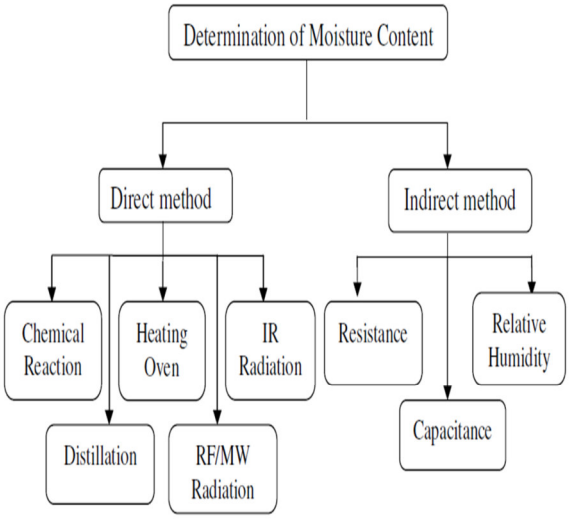


Figure 5.Co-axial line setup

Methods for Dielectric properties and Moisture contentmeasurement of the seeds

There are different methods for moisture content determination. The microwave dielectric properties and prediction of moisture content from overlay method have been compared with those obtained by waveguide reflectometer method and VSWR slotted line method. The sensor is very useful in agricultural field and it can be measured by the vector network analyzer as well as dielectric properties is important parameter of sensor such as dielectric constant (ε_r) and

loss tangent (tanδ) [4-8]. The loss tangent is always inversely proportional to moisture content at the selected frequencies. It is always lower than 1. The dielectric property is always equal to the differences of dielectric constant (ε') and the loss factor (ε")



CONCLUSION

The technique is important for determination the moisture content. Many techniques have been done the work but due to large measurement setup, time consuming, less accuracy not considered in agricultural fields. After analysis the techniques the oven drying technique is better to other techniques.

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SP-9

ANALYSIS OF FEED TECHNIQUES FOR MICROSTRIP MOISTURE SENSOR

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ABSTRACT

Microstrip antenna as a moisture sensor is very important for detecting the moisture of grains. The feed techniques are important part of microstrip patch antenna for proposed the design. In this paper analyzed the feed techniques for microstrip patch antenna as a sensor with low spurious feed radiation, easy to fabricate.

Keywords: Microstrip patch antenna, spurious feed radiation, grains, moisture.

INTRODUCTION

Basically microstrip element consists of an area of metallization support above the ground plane, named as microstrip patch. The supporting element is called substrate material which is placed between the patch and the ground plane [1-3]. The microstrip antenna can be fabricated with low cost lithographic technique or by monolithic integrated circuit technique. Using monolithic integrated circuit technique we can fabricate phase shifters, amplifiers and other necessary devices, all on the same substrate by automated process [2-5]. In majority of the cases the performance characteristics of the antenna depends on the substrate material and its physical parameters. This unit will give the basic picture regarding microstrip antenna configurations, methods of analysis and some feeding techniques [6].

FEED TECHNIQUES

There are mainly four basic methods for the feeding to these antennas-

a. Microstrip Line Feeding Method
b. Co-Axial feed Method
c. Aperture Coupled Microstrip Feed Method
d. Proximity Coupling Method

a. Microstrip Line Feeding Method

Using microstrip line we can give excitation to the antenna as shown in the figure 1.2. This method is very simple to design and fabricate. But this technique suffers from some limitations. If substrate thickness is increased in the design then the surface waves and the spurious radiation also increases [7]. Because of that the undesired cross polarization radiation arises. Microstrip line feeding can be used in the conditions where performance of the antenna is not a strict matter. The edge coupled feed can be improved with coplanar wave guide feeding. The microstrip line feed as shown in figure 1.

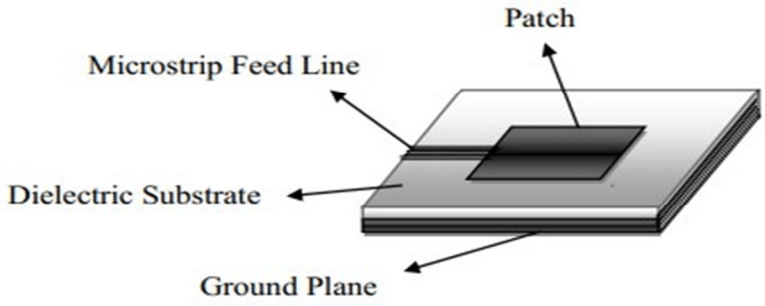

Figure 1. ***Microstrip line feed technique***

b. Co-axial feed method

Coupling of power to the microstrip patch antenna can be done by probe feeding method. The inner conductor of the probe line is connected to patch lower surface through slot in the ground plane and substrate material [6]. Design simplicity and input impedance adjustment through feed point positioning, makes this feeding method popular [8]. But there are some limitations also like larger lead for thicker substrate, difficulty in soldering for array elements etc. The coaxial feed method as shown in figure 2.

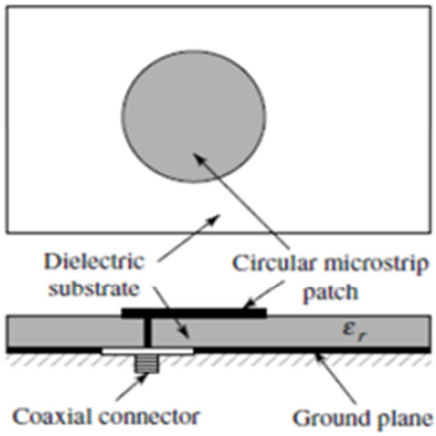

Figure 2. Co- Axial feed method

c. Aperture Coupled Feed

This method employs ground plane between two substrates. A slot will be placed on the ground plane and feed line will be placed on lower substrate [9]. This will be electromagnetically connected to patch on the upper substrate through the ground plane slot. One should take care about substrate parameters and they have to choosein a way that feed optimization and independent radiation functioning can exist. The aperture coupled feed as shown in figure 3.

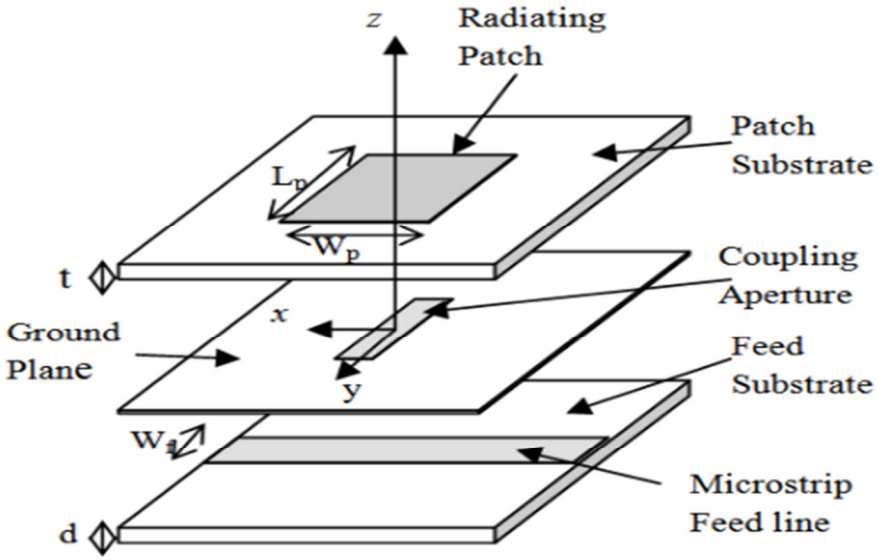

Figure 3. Aperture Coupled Method

d. Proximity Coupled Feed Method

This method can be employed, where two or multilayer substrate configuration is considered. Generally in this configuration, microstrip line will be placed on lower substrate and the patch element will be placed on the upper substrate. Other name for this feeding is electromagnetically coupled feed [10]. Capacitive nature will appear between feed lines and patch in this case. By choosing thin lower substrate layer and placing patch on top layer will improve the bandwidth and reduce the spurious radiation. Fabrication of this feeding is slightly difficult because of alignment problems in feed and patch at proper location. Peaceful thing is soldering and related problems can be eliminated. The proximity coupled feed as shown in figure 4.

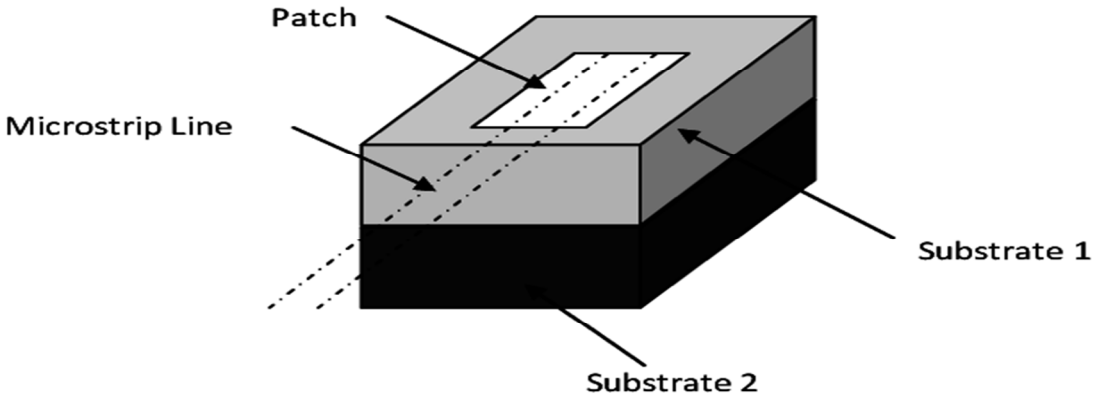

Figure 4. Proximity Coupled Feed Method

COMPARISON OF ADVATAGES AND DISADVANTAGES OF FEEDING METHODS

Feed Methods	Advantages	Disadvantages
Microstrip Line	• Monolithic • Easy to fabricate • Easy to match by controlling • Insert position • Easy to match • Low spurious radiation	• Spurious radiation from feed line, especially for thick substrate when line width is significant
Coaxial Feed	• Easy to match • Low spurious radiation	• Large inductance for thick substrate • Soldering required
Aperture Coupled	• No direct contract between feed • and patch avoiding large probe reactance or width microstrip line • No radiation from the feed and active devices since a ground plane separates them from the radiating patch	• Multilayer fabrication required • Higher back lobe radiation
Proximity Coupled	• No direct contact between feed and patch • Can have large effective thickness for patch substrate and much thinner feed substrate	• Multilayer fabrication required

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SP-10

PHYTOCHEMICAL AND ANALYTICAL STUDIES ON *NARDOSTACHYS JATAMANSI*: A REVIEW

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ABSTRACT

Modern psychotropic drugs used to counteract stress have shown that they do not address the psychopathology of stress and also produce numerous adverse effects. Moreover there is no specific anti-stress drug in modern medicine, though anxiolytics are used to cope up the stress. The rhizomes of the small shrub *Nardostachys jatamansi* DC are used as antistress agent in the conventional indigenous practice of medicine. The plant has acquired great deal of attraction for the qualitative and quantitative determination of its phyto-constituents. Analysts have also found it apt to develop organic blendes with Nardostachys Jatamansi phytoconstituents for targeted drug delivery. Space for the development of faster, cost-effective and simpler methods for detection, determination, quantification, and validation of the therapeutic constituents of interest is worked out through systematic survey of literature.The review covers the analytical methods developed and uncovers the knowledge gap for further studies.

KEYWORDS:Nardostachys Jatamansi DC, phytoconstituents

Nardostachys jatamansi DC

Present-day science has recognized and considered the dynamic measures of plant- origin drugs in modern pharmacotherapy. These herbal therapeutics are known since ancient civilizations[1]

Nardostachys jatamansi DC is known as jatamansi or spikenard. The rhizomes of the small shrub are used in the indigenous systems of medicine since ancient times as antistress agents. It is sold in India as the anticonvulsant Ayurvedic drug, *Ayush 56*.[2] Modern psychotropic drugs used to counteract stress have shown that they do not address the psychopathology of stress and also produce numerous adverse effects.[3-5] Moreover there is no specific anti-stress drug in modern medicine, though anxiolytics are used to cope up the stress.[6-8] *Nardostachys jatamansi* DC Belongs to the family Valerianaceae. *N. jatamansi* is inhabitant to the Alpine Himalayas.[9] It is a perilously dying out, rhizome-bearing medicinal plant of high altitudes (3,000 to 5,000 m) [Figure 1].The plant is known to possess calming and soporific action on the central nervous systemand has a rich history of medicinal value for centuries in traditional systems of medicine.[10-11] Rhizomes of the plant are used as a tonic, refreshment, antispasmodic and to take care of hysteria, convulsions, epilepsy and for neuroprotective efficacy in cognitive impairment.[12,13]

The plant is medicinally used to treat sleeplessness, blood circulatory and mental ailments, prominently reported as heptotonic, cardiotonic, analgesic, and diuretic in the Unani system of medicine[14].

Nardostachys jatamansi contains a variety of sesquiterpenes and coumarins. The sedative sesquiterpene Valeranone is a major component of the root essential oil.[15-17] Extensive exploration of the phytoconstituents of the herb have resulted in the identification of other terpenoids including spirojatamol,nardostachysin, and calarenol.[15,18-23] Coumarins including jatamansin, Jatamoles A and Jatamoles B have been isolated from this plant.[24-32]

The plant is used to produce perfumes and dying substances. The rhizomes and roots have attracted focus of chemical studies. Few biologically active compounds as reported include jatamansone (valeranone) as hypotensive and tranquilizing agent [34-38] for treating insomnia and as hair growth promotion agents.[32,38 – 40]

Ethanol-induced Gastric Ulcers have shown promising response to treatment with N jatamansi.[41]Anti-neuroinflammatory effects of sesquiterpenoids isolated from Nardostachys jatamansi are potential source of medicinal resources.[44-47]

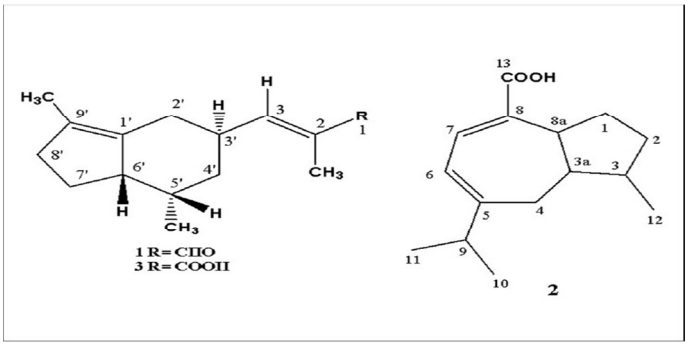
The vital oil procured from the roots of Jatamansi exhibit antioxidant,[51-57] anticancer [58-64]and Aβ42 Cytotoxic[65-67] activity. The herb shows protective effect on radiation-induced damage at biochemical and chromosomal levels.[68]Nardostachys jatamansi root extract modulates the growth of certain neuroblastoma cell lines through MYCN mediated regulation of MDM2 and p53.[69] Sandeep PM and coworkers have reported the effectiveness of N Jatamansi formularions in the treatment of polycystic ovarian syndrome.[70]
Nardostachys Jatamansi DC extract alleviates insulin resistance and regulates glucose metabolism in c57bl/ksj-db/db mice through the AMP-activated protein kinase signaling pathway,[71]as well as shows promising activity in the management of acute pancreatitis.[72-75]

Efficacy of nardostachys jatamansi against the radiation induced haematological damage has been tested.[76]Orthopedic applications of spikenard herbal rhizome decorated microstructured polymer biocomposites and their *in vitro* cytotoxicity have also been worked out.[77]

Reversal of reserpine-induced orofacial dyskinesia and catalepsy by Nardostachys Jatamansi have been reported.[78]. N Jatamansi also inhibits lipopolysaccharide-induced endotoxin shock.[79]

METHODS OF DETERMINATION

The bioassay-suported refining of the 6C fractions of the rhizomes of N. Jatamansi,column separation with silica gel and subsequent purification with solvents gave nardal, jatamansic acid, nardin and various other phytochemicals of medicinal interest.[Figure 2].



Analytical method (HPTLC) for quantification of valerenic acid, Jatamansi and its substitutes in Ayurvedic drugs has been developed by Srivastava A & coworkers.[80] GC-MS analysis and anti-microbial activities of volatile oil of Nardostachys Jatamansi DC rhizomes obtained from Haridwar Region, Uttrakhand has also been reported.[81,82]Antioxidant, biomolecule oxidation protective activities of Nardostachys Jatamansi DC and its phytochemical analysis by RP-HPLC and GC-MS have been worked out by Razack S and coworkers.[83] Development of validated HPTLC method for quantification of Jatamansone in Jatamansi oil have also been the topic of vital interest.[84]

HPTLC and various hyphenated techniques have been developed for the quantification of valerenic acid and various constituents in ayurvedic drug Jatamansi and its substitutes.[85]A rapid and highly sensitive UPLC-QTOF-MS method has been reported for quantitative evaluation of Nardostachys Jatamansi using Nardin as the marker.[86] A Simple and Rapid UPLC-PDA method for quality control of Nardostachys jatamansi has recently been reported.[87]An optimized HPLC-UV method for quantitatively determining sesquiterpenes in Nardostachyos Radix et Rhizoma has been developed by Le VNH et al.[91]. The phytoconstituents of N Jatamansi blended into polymeric matrices have been the recent field of interest for orthopedics research.[88]

DISCUSSION

The present review of the developments in the exploration of the medicinal phytoconstituents of the herb N Jatamansifor emphasizes greater needandhighlights space for the development of faster, economic and simpler methods for detection, determination, quantification, and validation of the therapeutic constituents of interest. Electrochemical methods of analysis may provide promising solution to this issue. Modern sensors with nano components may also enhance the usefulness of this wonder herb by multifolds.

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SP-11

ELECTROCHEMICAL STUDIES ON SYNTHESIZED SULPHONAMIDE ANILS OF THERAPEUTIC INTEREST

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ABSTRACT

A series of synthesized 4-[({2-hydroxy-5-[2-(substituted methyl phenyl) diazen-1-yl] phenyl} methylidine) amino] benzene sulfonyl acetamideSchiff base derivatives were analysed for their voltammetric behaviour on dropping mercury (DME) using DPP and by using glassy carbon electrode in cyclic voltammetry and Coulometry techniques. The electrode process is irreversible and diffusion controlled. Charge transfer coefficient (α_{n_a}), formation constant ($k^{\circ}_{f,h}$) and diffusion coefficient were worked out. Reductive cleavage of the bioactive sulphonamides was found to be pH dependent with change in the pK_a of the parent sulphonamide (sulphacetamide -7.0) towards more acidic side (4.61 and 3.58 respectively) indicating their altered redox characteristics. It is suggestive that it may lead to altered biochemical activity facilitating the development of a novel sulfa drug with better medicinal value, lesser toxicity towards the host and possibly a lower residence time of its residue in the ecosystem. Natural attenuation through biodegradability may also get altered due to the incorporation of the azo & imine moieties which are potentially bioactive pharmacophores prominently reported in literature.

KEYWORDS:Sulphonamides, Anils, differential pulse polarography, cyclic voltammetry, Coulometry.

INTRODUCTION

Sulphonamide drugs have pioneered the developments for the antibiotic revolution in medicine. They are the origin of numerous families of drugs. Sulfonyl ureas include potent hypoglycemic agents[1-4] Sulphonamides exhibit antimalarial, diuretic[5], anti-carbonic anhydrase, anti-thyroid[7]and anti-tumor activities.[8-11] Sulphonamides possessing a thiourea scaffold are reported to be valuable *in vitro as well as ex vivo* inhibitors of carbonic anhydrase.[6]

Sulphonamides restrain the carbonic anhydrase-mediated carbamoyl phosphate biosynthesis, which is the first step of pyrimidine nucleotide biosynthesis. Sulphonamides consequently have prospective for the development of advance therapies for malaria.[12] Antiplasmodials, derived sulphonamides, ureas, thioureas and amides tested against chloroquine resistant and chloroquine sensitive pathogens.[13,14]

A broad spectrum of pharmacological and biological properties exhibited by the azo and imine linkages characterized by –N=N- and -N=CH- respectively have attracted medicinal scientists for long. Likewise, electrochemical behaviour of imines has drawn the attention of scientists.Investigations on the reduction mechanism of various imines in DMF using various electrochemical techniques has been pioneered by Fry and Reed.[15] Half wave potential of various imines of the type ArCH=NAr have been compiled by,[16-18] The reduction potential of various imines was found to depend on the size of aromatic group at either side of the --CH=N- moity,[19] the type of substituent attached to the aromatic ring[20-22] and intramolecular hydrogen bonds.[23,24]

DIFFERENTIAL PULSE POLAROGRAPHY

Differential pulse polarographic studies of the 4-[({2-hydroxy-5-[2-(substituted methyl phenyl) diazen-1-yl] phenyl} methylidine) amino] benzene sulfonyl acetamide were carried out in BR buffers in the pH range 2.61 to 10.5.The polarographic reduction was found to be dependent on pH. A typical pulse polarogram is shown in Fig. 1 and polarographic characteristics have been compiled in Table 1.0.

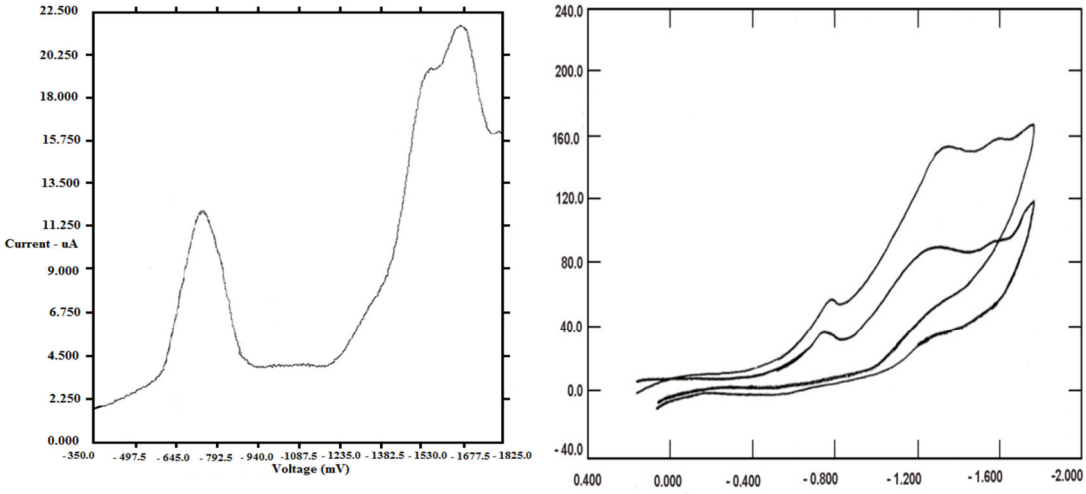


Figure -1a,b ***Differential pulse polarogram and cyclic voltammogram of 4-[({2-hydroxy-5-[2-(substituted methyl phenyl) diazen-1-yl] phenyl} methylidine) amino] benzene sulfonyl acetamideat standardized conditions.***

The peak potential shifted towards more negative values with the rise in pH for all the compounds indicating the participation of protons in electrode process (fig. 2). Plot of i_d vs. pulse amplitude (fig.3) and i_d vs. concentration (fig. 4) are linear passing through the origin confirming the diffusion controlled nature of the electrode process. The reversibility of the electrode process was established by recording polarograms at different concentrations of the anils and it was observed that $-E_{1/2}$ shifted towards more negative potential with rise in concentration. This behavior clearly defines the irreversible nature of the electrode process, which is further confirmed by logarithmic analysis i.e. the slope of the plot of [$-E_{d.e}$. vs log ($i/i_d - i$) – 0.546 log t] being greater than 59.2/n mV, here t is drop time (fig.5).

The number of protons (*p*) involved in the rate determining step is calculated from the slope of $-E_{1/2}$ vs. pH plot as under:

$$\frac{\partial E_{1/2}}{\partial pH} = \frac{0.0591}{\alpha n_a} \text{(i)}$$

Diffusion coefficient ($D_0^{1/2}$) and heterogeneous rate constant ($K^0_{f.h}$) values were calculated as:

$$E_{1/2} = -0.2412 + \frac{0.0591}{\alpha n_a} \log \frac{1.34\, K^0_{f.h}\, t^{1/2}}{D_0^{1/2}} \text{(ii)}$$

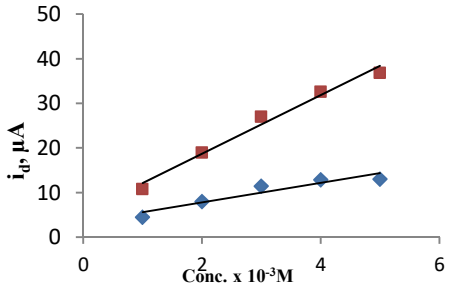


Fig – 2

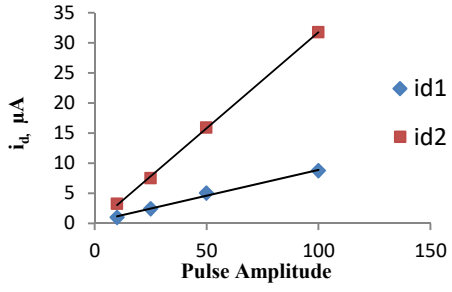


Fig – 3

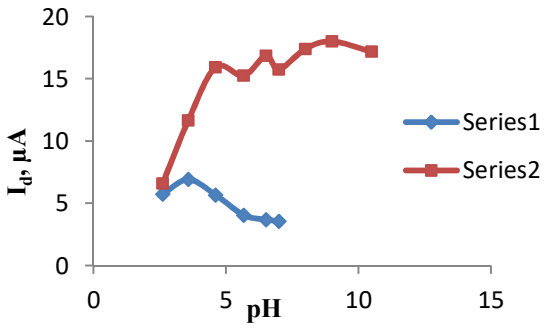


Fig – 4

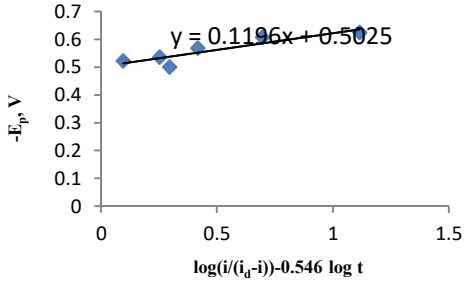


Fig – 5

Table -1 ***Differential pulse polarographic characteristics of some 4-[({2-hydroxy-5-[2-(substituted methyl phenyl) diazen-1-yl] phenyl} methylidine) amino] benzene sulfonyl acetamide, representative of the behavior of the studied anils.***

S No.	R	Bond	$-E_p$,V	I_d, µA	α_{n_α}	I µA x 10^2	$\partial E_{1/2}/\partial pH$, V/pH	$D_o^{1/2}$, Cm^2sec^{-1}	$K^o_{f,h}$ cm sec^{-1}
1	o-CH_3	-N=N-	0.625	2.882	0.238	1.09	0.007	$0.899x10^{-7}$	$0.925x10^{-7}$
		-CH=N-	1.401	7.706	0.150	2.91	0.013	$2.40\ x10^{-7}$	$0.330\ x10^{-6}$
2	m-CH_3	-N=N-	0.704	7.325	0.018	2.77	0.007	$2.28\ x10^{-7}$	$0.226\ x10^{-6}$
		-CH=N-	1.430	20.949	0.038	7.93	0.024	$6.53\ x10^{-7}$	$0.142\ x10^{-5}$
3	p-CH_3	-N=N-	0.770	8.428	0.230	3.19	0.008	$2.63\ x10^{-7}$	$0.267\ x10^{-6}$
		-CH=N-	1.645	20.170	0.298	8.17	0.001	$6.73\ x10^{-7}$	$0.950\ x10^{-6}$

CYCLIC VOLTAMMETRY

Cyclic voltammetry was performed at glassy carbon electrode in the pH range 1.8-11.2 and exhibited the cathodic peaks assignable to the reduction of –N=N- and -CH=N groups (fig.1b). In this pH range the electrode process is irreversible as depicted by the observation that, no anodic peak could be realized. Voltammogram at scan rates ranging from 20 to120 mV/s. The cathodic peak potential shifted towards more negative values with increasing scan rate further confirms the irreversible electron transfer. The diffusion derived nature of the electrode reaction is depicted by the plots of i_{pc} (cathodic peak current) vs $\upsilon^{1/2}$(scan rate) being a straight line through the origin. Cathodic peak current increases linearly with the strength of the depolarizer and hence obeys Randles- Sevic equation,which implies that the process is diffusion controlled.

CONTROLLED POTENTIAL ELECTROLYSIS AND COULOMETRY

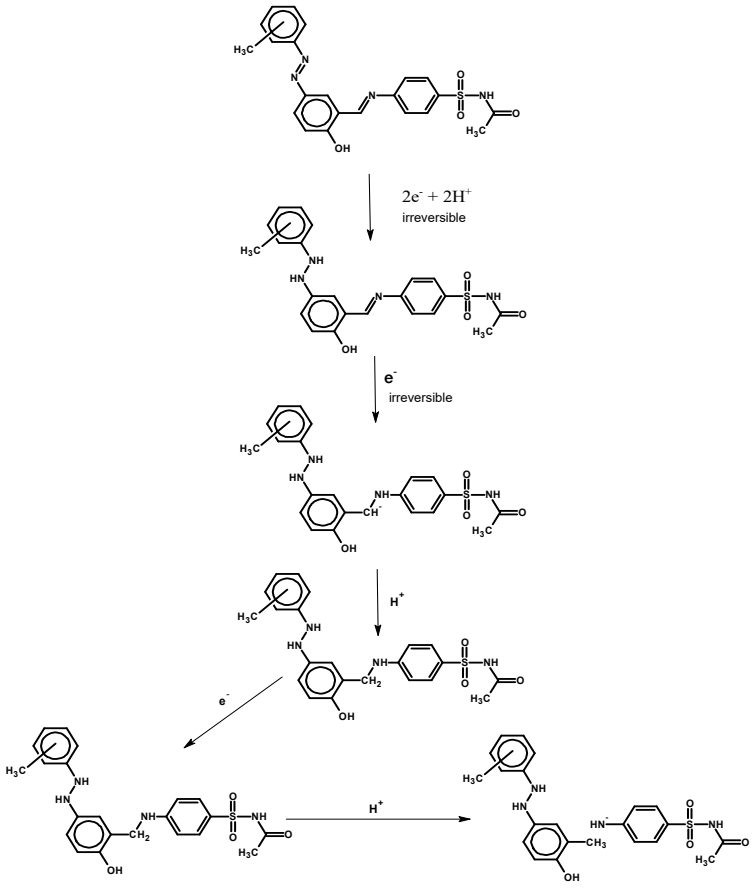
Number of electrons transferred, 'n' were calculated from the charge consumed in acidic medium by using controlled potential coulometry. Electrolysis was carried out at -1.4 V against Ag /AgCl reference electrode. During electrolysis, solution was continuously stirred and purged with nitrogen. 'n' was calculated using the equation Q = nFN. IR spectroscopy was use to ascertain completion of electrolysis. Vanishing of cathodic peak established the completion of reduction of –N=N- and -CH=N bonds.

EXPERIMENTAL

All chemicals were AR grade. Shimadzu, Japan model Prestige IR 20 spectrophotometer was used to record IR spectra on KBr. pH measurements were made using decibel DB- 1011digital pH meter provided with a glass calomel electrode. The differential pulse polarographic (DPP) measurements were carried out using the ELICO CL362 polarographic analyzer (India). An electrode assembly comprising of a DME, SCE and platinum wire was used. The solutions were purged with pure nitrogen gas for 10 min and then polarographed at ambient temperature. Cyclic voltammetry was performed using a Potentiostat Versastat EG and G II Princeton Applied Research Model 273 coupled with 270/250 research electrochemistry software 4.30.

REDUCTION MECHANISM

On the basis of the above three electrochemical investigations, mechanism for the reduction of the 4-[({2-hydroxy-5-[2-(substituted methyl phenyl) diazen-1-yl] phenyl} methylidine) amino] benzene sulfonyl acetamides has been postulated. In the reduction of the azo group $2e^-$, $2H^+$ irreversible reduction is proposed. In the reduction of the imine group protons are not involved in the rate determining step. A $2e^-$, $2H^+$ reduction is proposed to take place by addition of the electron first, followed by H^+ and subsequently, the next electron adds followed by the proton rendering the benzene -N-(substituted) benzene-1-sulphonamide molecule free. (Scheme-I)



Scheme-I

RESULTS AND DISCUSSION

Acidic media favored the ease of reduction of the azo moiety and in, *o*, *m*, *p*, positions the methylgroup alters the strength of the azoic linkage which is clearly depicted by the id_1 values at the pK_a of the corresponding anils. The anils studied indicate the participation of protons in the electrochemical reduction at the azoic site. The catalytic hydrogen wave highly disorganizes the reduction peak of the imine site which is significant when the medium turns progressively basic. The electrode process is diffusion controlled and irreversible. Reductive cleavage of the bioactive sulphonamides is pH dependent with change in the pKa of the parent sulphonamide (sulphacetamide -7.0) towards more acidic side (4.61 and 3.58 respectively) indicating their altered redox characteristics. It may lead to altered biochemical activity facilitating the development of a novel sulfa drug with better medicinal value, lesser toxicity towards the host and possibly a lower residence time of its residue in the ecosystem. Natural attenuation through biodegradability may also get altered due to the incorporation of the azo & imine moieties which are potentially bioactive pharmacophores prominently reported in literature.

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SP-12

A QUESTIONNAIRE BASED STUDY OF RADIATION PROTECTION AWARENESS AMONG PATIENTS WAITING FOR RADIOLOGICAL IMAGING IN AN ACADEMIC TERTIARY CARE HOSPITAL B.M.C. SAGAR, M.P. INDIA.

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ABSTRACT

Due to lack of knowledge regarding benefits and risks of ionizing radiation, people get apprehensive whenever they are being exposed to x-rays or similar forms of radiation either for diagnosis or treatment of their health problems. It is highly important to make them aware about the pros & cons of ionizing radiation. So the present study has been conceived to assess the knowledge level of patients regarding radiation protection and radiological safety, visiting an academic tertiary care hospital B.M.C. Sagar M.P. region of central India. To assess the knowledge level of patients a questionnaire was designed having different type questions based on basics of radiation protection and radiological safety. The study included 230 patients who undergo some imaging procedure. Awareness level was assessed based on the answers given by individual patients. Out of 230 participants, 159 (69%) were males while female were 71(31%). 42% patients were below age of 30 years; 48% were in the age group between 31-60 years and 10% were above 60 years. Primary school and secondary/senior secondary level both have same 37% participants and 26% were graduates or higher qualified. 80 (37%) patients out of 216 know the x-rays are an ionizing radiation while 117(54%) patient says that x-rays are hazardous to human health. Almost 50% were aware that radiation is harmful for the pregnant ladies. Only few know about regulatory requirements and its impact on individual. So it is essential to educate the general public about regulatory framework and its impact on health care facilities.

KEYWORDS:Patients, x-ray Exposure, Radiation Protection, Risk awareness.

INTRODUCTION

The present practice of modern medicine is the era of evidence based medicine in which imaging modalities like X-Ray radiographs, CT Scan, MRI Scan, Ultra-Sound Scan, Scintigraphy, SPECT, SPECT/CT and most recently PET/CT and PET/MRI, are playing vital role for the diagnosis of exact cause of illness or injury in patients.[1] Many of these diagnostic procedures involve exposure to the ionizing radiation in the form of X-Rays or due to radioactive emission from radio-nuclides injected to the patient.[2] Although these diagnostic investigations involve very low quantities of radiation; it is highly implicit for the patients, their attendants, radiographers, radiologist, nurses and referring physician to know about the potential hazards of radiation exposure.[3] "Radiation" consists of wide range of energy spectrum and most of them had been found injurious to human health.[4] Depending on their capability to cause damage to biological cells; radiation may be classified as i) ionizing and ii) non ionizing radiation.[5] The biological effects of ionizing radiation are basically due to damage to the DNA which is the critical target. When radiation causes ionization along the track it traverses through the medium are called directly ionizing radiation like beta particles, alpha particles, electrons and heavy charged particles. When ionization is caused due to secondary particles produced due to deposition of radiation energy along the track it traverses through the medium are called indirectly ionizing radiation like x-rays, gamma rays, neutrons etc. Those types of radiations which cause very high ionization along the track it traverses are known as high LET radiation. Exposure to such high LET radiation will cause severe damage to the exposed individuals. Alpha particles, heavy charged particle beams and high energy neutrons are few examples of high LET radiation. On the other hand; there are x-rays, gamma rays and electrons which produce low density of ionization; are called low LET radiation.[6]When the effect of exposure to ionizing radiation affects to the exposed individual in their life time; are known as 'Somatic' effects. Sometimes exposures to ionizing radiation do not affect the exposed individual but affects their progenies are called 'Genetic' effects. Radiation effects are further classified as (1) Deterministic effects and (2) Stochastic effects. Deterministic effects are having a threshold dose below which it will not occur but it will certainly occur if the threshold doses have been crossed. Severity of such effects increases with increasing the radiation dose in affected individuals. Stochastic effects do not have any threshold dose and can occur

even at very small doses of radiation. However the probability of occurrence increases with increasing radiation dose rather than its severity.[7-8]

So it is well established fact that exposure of ionizing radiation is not only beneficial but also causes serious health problems to the exposed individuals; should be used judiciously. Due to lack of knowledge regarding benefits and risks of ionizing radiation, people get apprehensive whenever they are being exposed to x-rays or similar forms of radiation either for diagnosis or treatment of their health problems.[9-11] For getting the best cooperation from the patients and their relatives, it is highly important to make them aware about the pros & cons of ionizing radiation.[12] So the present study has been conceived to assess the knowledge level of patients regarding radiation protection and radiological safety.

MATERIALS AND METHODS

The questionnaire based face to face studies have been performed on 230 patients who visited the Department of Radio-Diagnosis & Imaging for some imaging procedures. The questionnaire was having four sections. Section A covered the personal information (demographic data) related question such as name, age, sex, educational level, and occupation etc. It also covers the basic knowledge about radiation and its hazards. Section B included questions related to radiation hazards, repetition effects of ionizing radiation in radiological examinations and the safe radiological examinations modality for pregnant women. Section C covers the radiation safety related questions and the last fourth section D covered the regulatory related questions. Access to study material or any other source of information during the test was totally prohibited to the participants. The questionnaire was a combination of yes/no/don't know and multiple-choice type questions.

RESULTS

Out of 230 patients selected for the study; 159 (69%) were males and 71(31%) were female participants. The educational level of 86 (37%) participants was up to primary school only, equal numbers of participants were having education up to secondary/ senior secondary level. 54 (24%) participants were having education up to graduation/ post graduation level while 4 (2%) were having education up to doctorate level or some professional post PG qualification. Participants were having wide spectrum of different occupations including 32 (14%) unemployed youths. Maximum numbers of participants were dependent on farming (46; 20%) or were daily wage laborers (38; 16.5%). 36 (15.6%) were in office jobs and 28 (12.1%) were self employed. 19 (8.3%) were retired persons and 31 (13.5%) were involved in non-specific jobs (Table – 1). Out of 230 patients included in the study only 216 (94%) responded to the questionnaire. In responder there were 154 (71.3%) males while 62 (28.7%) were females. 97 (42%) patients were having the age ≤ 30 years, 110 (48%) were between the age of 30 – 60 years while 23 (10%) were having age more than 60 years (Table – 2). As per our expectations patients 37 (68.5%) out of 54 graduates/ post graduates were having better awareness about radiation symbol. 3 (75%) out of 4 having post PG qualifications were aware about radiation symbol; 26 (30%) out of 86 patients having education up to secondary/senior secondary level and only 11(12.8%) out of 86 patients having education up to primary level were aware about radiation symbol (Table – 3). Surprisingly maximum correct answers were given 110 (51%) for the question of section – B of the questionnaire instead of section – A 76 (35.3%). Section C and D were answered correctly by 75 (34.7%) and 65 (30%) participants only. Critical analysis of the answers reveal that out of 216 responders, 80(37%) patients know that x-rays are ionizing radiation, 117(54%) patient know that x-rays are hazardous to human health, 108 (50%) know that radiation is harmful for the pregnant women and 58 (27%) know that CT scan exposes more radiation than simple x-ray radiography. Most of the patients were not having any knowledge about the national regulatory body for radiation applications i.e. Atomic Energy Regulatory Board (AERB). It is encouraging to see that approximately one third patient populations knew about radiation safety which is a matter of concern for radiation worker and the patients.

Table - 1. Socio-demographic Characteristics of participants

Characteristics		Number of participants	Percentage (%)
Gender	Male	159	69
	Female	71	31
Qualification	Primary School	86	37
	Secondary/Senior Secondary	86	37
	Graduate/ Post Graduate	54	24
	Others	04	2
Occupations	Unemployed	32	14
	Farmer	46	20
	Self-employed	28	12.1
	Clerk	36	15.6
	Daily wager	38	16.5
	Retired	19	08.3
	Others	31	13.5

Table - 2, Age wise distribution of participants

Age (Years)	Male	Female	Total
≤ 30	65	32	97
31 - 60	78	32	110
> 60	16	7	23
Total	159	71	230

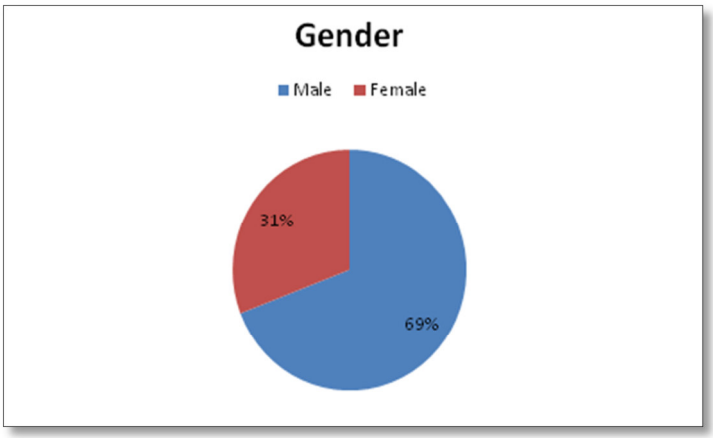
Table –3. Awareness about radiation warning symbol as per qualification

Qualification	Response of participants (N = 216)			
	Yes		No	
	Number	%	Number	%
Primary School	11	5.1	66	30.6
10 + 2	26	12	55	25.5
Graduate/Post Graduates	37	17.1	17	7.9
Other	3	1.4	1	0.4
Total	77	35.6	139	64.4

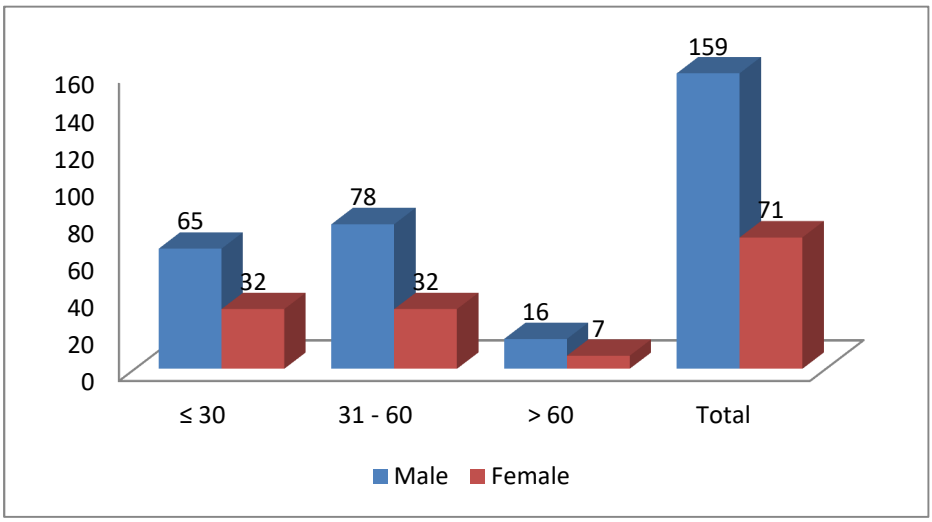
Table - 4. Performance of participants to the questionnaire (N=216)

Section	No of participants who answered correctly	Percentage of participants
A	76	35.3
B	110	51
C	75	34.7
D	65	30

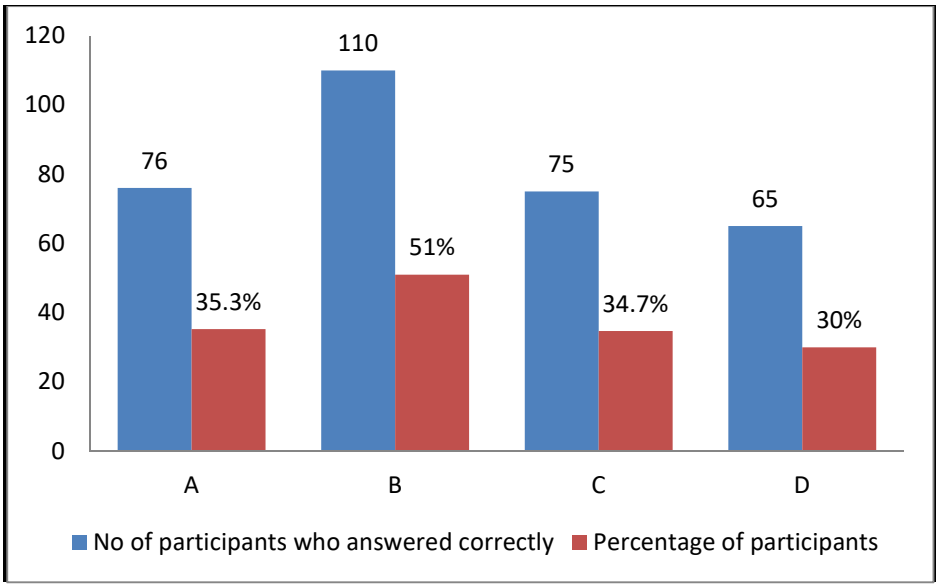
Graph -1 ***Male and female contribution ratio chart***



Graph-2 ***Male and female age distributionchart***



Graph -3 ***Performance of participants to the questionnaire chart.***



DISCUSSION

It is very vital to have good knowledge about benefits and risks of radiation exposure for diagnostic or therapeutic purposes. Better knowledge about pros & cons of radiation exposure will enhance the participation of community towards health issues. Many times it have been observed that people get nervous and worried whenever they are being asked to undergo any procedure involving radiation exposure. Such situations may be attributed to ignorance, hearsay and actual knowledge of harmful effects of all such forms of radiation exposure. A similar study conducted in Nigeria (Margaret A. Briggs-Kamara et.al) reported that good number of patients had formal education though not aware of harmful effects of radiation exposure.[13] They suggested that radiation workers should take the responsibility of educating patients before performing the procedures. Dr. Runak Taher Ali et. al. in their study at Erbil Hospital to assess the awareness of radiation safety among patients found that approximately 60% patients were knowing that radiation causes damage.[1] Round one third patients had x-rays without asking physician and similar proportion were aware about radiation symbols and large majority of patients wish to know advantages of radiation. They felt a need to educate public on radiation safety to allay their fears about radiation. A Turkish study by Aylin YUCEL et. al in a cross sectional survey reported that although many of the participants had undergone radiological examination previously; they had insufficient knowledge about radiation safety.[14] As majority of the patient population was having education up to primary level; they suggested introducing lessons on radiation safety in primary schools and providing information brochures in the waiting area could be useful. In our study also; it has been observed that awareness about radiation symbol increases with increasing education level as about 70% of the graduates were aware about radiation symbol in contrast to about 13% of the primary school educated. People having higher qualification even scored better (75%). Scores were not dependent upon the level of question; as maximum score was noted for section-B questions rather than section–A. About one third of the participants know that X-Rays are ionizing radiation and more than half participants were aware that x-rays are hazardous to human health. It is very satisfying to know that almost half participants were aware about the fact that x-rays are harmful for the pregnant women. More than one fourth of the participants knew that magnitude of radiation exposure during CT scan is much higher than normal radiographic procedure. Here it is mandatory that there should be a notice board with figure that shows if women are pregnant please inform the radiologist or the radiographer before the examination. Repetition of x-ray is also reported this may cause unwanted exposure to patient and radiation worker. For avoiding the repetition radiation workers should explain the procedures before carrying out exposures on patients.

CONCLUSION

So to conclude we can say good numbers of patients are aware about harmful effects of radiation but still majority do not know about it. Obviously; it is the responsibility of the government to educate general public about harmful effects of radiation; role of radiation professionals cannot be denied. Radiologists, radiographers and others involved is such practices should take the responsibility to explain the advantages and harms of a particular radiological procedure before performing the same. Display of posters and cartoons containing information about safe practices and regulatory requirements in the patient waiting area of Radio-diagnosis departments may be useful in improving awareness about radiological safety. One should not get panic about getting exposed to small amount of radiation as we all receive approximately 2.4 mSv/year from natural sources of radiation which cannot be avoided by any individual. Another area of concern is spreading awareness about regulatory framework. Regulatory requirement ensures quality assured and safe delivery of radiation services to patients following the rule of "extracting maximum

information/ therapeutic benefit and causing minimum harm" to the exposed individual or in other words as low as reasonably achievable (ALARA).[15]

CONFLICT OF INTEREST

Conflict of interest declared none.

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Questionnaire

Section-A

Socio-demography

Name -……. Age/Sex……..educational/qualification……..

Occupation…….

1-x-Ray radiation refers to Ionizing radiation.

a) yes ☐ b) no ☐ c) don't know ☐

2-Do you think MRI is also uses radiation?

a) yes ☐ b)no c) don't know ☐

3-Which modality of imaging exposes more radiation?

a) a single CT scan ☐ b) a single x-ray ☐ c) a single MRI ☐ d) a single USG ☐

Section-B

4-Do you know about x-ray hazards?

a) yes ☐ b) no c) don't know ☐

5- Do you know repetition of x-ray is harmful to us?

a) yes ☐ b) no ☐ c) don't know ☐

6- Which imaging modality is safe for pregnant woman?

a) Ultrasound ☐ b) CT ☐ c) x-RAY ☐

Section-C

7-Do you know any radiation safety tools?

a) yes ☐ b) no ☐

8-Do you familiar with radiation warning symbol?

a) yes ☐ b) no ☐

Section-D

9-Do you check license of x-ray machine before your x-ray imaging?

a) yes ☐ b) no ☐

10-Have you heard about radiation regulatory body AERB of India?

a) yes ☐ b) no ☐

SP-13

EVICTION OF Cr(VI) FROM WASTEWATER BY ION-SELECTIVE MEMBRANE ELECTRODE BASED ON POLYPYRROLE-CERIUM(IV)VANADOPHOSPHATE NANOCOMPOSITE

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ABSTRACT

The objective of the present study was to assess the suitability and efficiency of synthesized Polypyrrole-Cerium(IV)Vanadophosphate(Ppy-CVP) nanocomposite for the removal of Cr(III) from aqueous solution. Nanocomposite cation exchange membrane was prepared by solution casting method using Polypyrrole-Cerium(IV)Vanadophosphate and polyvinyl chloride (PVC) as a binder. The synthesis of membrane was confirmed by characterization of the nanocomposite membrane by various instrumentation techniques like SEM, EDX, FTIR, XRD, TGA. The experimental equilibrium data were tested by various potentiometric studies like Calibration curve, Effect of pH, Responsetime, Potentiometric titration studies. The experimental data was best followed by selective for Cr(III) metal, having detection limit (1×10^{-9} M to 1×10^{-1} M), response time (25s) and working pH range (5-8).The analytical utility of this electrode was established by employing it as an indicator electrode in potentiometric titration. Various experimental parameter studies proved the absorption of Cr(III) on nanocomposite. Therefore, the present nanocomposite could be applied to purify metal contained wastewater.

Keywords: Electrochemical sensing, Cr(III) Selective Ion-selective electrode; Characterization; Electrode potential

INTRODUCTION

Naturally occurring chromium maybe either trivalent or hexavalent; out of which Cr(VI) has a much higher toxicity. Human body has a tendency to detoxify Cr(VI) to some extent by converting it to Cr(III). It is mainly know to attack the respiratory system. Short term exposure causes cough, dyspnea, wheezing while long term exposure leads to septal perforations and ulcers, pneumonia and conditions as severe as lung tumor and lung cancer. Chromium(III) is an essential element for whose deficiency may cause diabetes, metabolic syndrome and accelerated atherosclerosis. The excessive uptake Cr(III) is equally harmful. Chromium(VI) is harmful for people working in the steel and textile industry. Contaminated potable water may also contain toxic Cr(VI) which is dangerous to human body.

Organic–inorganic conductive composite ion-exchangers are a latest development in the field of ion exchange membranes. They have been synthesized by theembedding inorganic polyvalent metal acid salts into a conductive polymer matrix [1–3]. These composites are highly sensitivie towards heavy metal ions and have been effectively used in wastewater treatment. Owing to their enhanced mechanical, chemical, and electrochemical properties, these materials have attracted the attention of scientific community [4–6].

Out of the most widely accepted electroanalytical techniques, ion-selective electrode based potentiometry is a novel technique useful for wastewater treatment when it comes to heavy meral pollution.Ion selective electrodes (ISEs) have been developed using this technique. Precipitate based ISEshave been efficiently employed for cationic and anionic determination in the form of homogenous as well as heterogenous IEC membranes [7–18].

In the presented manuscript, the authors have attempted to synthesize Polypyrrole based nanocomposite cation exchanger using Cerium(IV)Vanadophosphate as inorganic component and test its selectivity, ion exchange capacity and tendency for quantitative separationof metal ions.

MATERIALS AND METHODS

Reagents, Chemicals and Instrumentation

Pyrrole was obtained from Spectrochem; $FeCl_3$, HCl and $CrNO_3$ from Merck with a stated purity of 98%.$NaVO_3$ and $H_8N_8CeO_{18}$, were from CDH, while H_3PO_4 was from Qualigens. All the reagents and chemicals were analytical grade. Scanning Electron Microscope (SEM) was done using Jeol JSM- 6510 LV microscope, and other studies using digital potentiometer model: Equiptronics EQ 609, India; with a saturated calomelelectrode as reference electrode.

Preparation of Cerium(IV)Vanadophosphate (CVP)

Cerium(IV)Vanadophosphate was synthesized at room temperature by mixing 0.1 M Sodium (meta) vanadate, 0.1 M Ammonium ceric nitrate, and 0.1 M Orthophosphoric acid in a ration of 1:1:1 by volume with constant stirring. White precipitate of Cerium(IV)Vanadophosphate was obtained which was allowed to settle down for 24 hrs, filtered and washed until the filtrate showed neutral pH. Finally it was dried in an oven at 80°C. The different ratios of inorganic ion

exchanger are given in **(Table 1)**. On the basis of high ion exchange capacity (IEC) sample **S-2** was selected for further studies**.**

Preparation of Polypyrrole-Cerium(IV)Vanadophosphate (Ppy-CVP) composite ion-exchange material

Ppy-CVP was synthesized by in-situ chemical oxidative polymerization of Pyrrole in the presence of CVP particles. 2g of CVPwas dissolved in 250 ml DMWand stirred. Then pyrrole monomer was added and stirred for 45 min to ensure the adsorption of pyrrole on the surface of CVPparticles. After that, 0.5 M $FeCl_3$ solution was added to the mixture and further stirred for 24 hours. The resultant mixture formed black slurries indicating the formation of Ppy-CVP. It filtered, washed and dried at 50°C thus yielding Ppy-CVP composite ion exchanger.

On the basis of varying Ppy concentrations, different membranes were prepared as given in **Table 2** and due to its high IEC, sample **P-4**was selected for further studies.

Selectivity Studies ($K_d$values)

The selectivity of the metal ions is majorly depicted in the form of distribution coefficients of the counter ions (K_d values)

The K_d values of various metal ions on Ppy-CVPcomposite was determined by batch method. 0.1g samples of the composite exchanger beads in the H^+ form were taken in Erlenmeyer flasks with 20 ml each of different metal nitrate solutions in the desired medium and stirred for 24 hours. The concentration of metal ions in the solution before and after equilibrium was determined by titrating against standard 0.005M solution of EDTA**[19] (Table 3)**. The ratio of metal ion concentration in the exchanger phase and in the solution phase gives the distribution quantity so we can say that distribution coefficient is the measure of fractional uptake of metal ions competing for H^+ ions in a solution by an ion-exchange material and can be mathematically calculated using the formula:

$$K_d = (I - F)/F \times V/M\ (mlg^{-1}) \qquad (1)$$

Where *I* is the initial amount of metal ion in the aqueous phase, *F* is the final amount of metal ion in the aqueous phase, *V* is the volume of the solution (ml) and M is the amount of nanocomposite cation exchanger (g).

Preparation and Characterization of Ppy-CVP composite IE membrane

Fine powders of cation exchanger materials were mixed with PVC and THF and stirred for 48 hours and cast to four membranes of thickness 0.21, 0.18, 0.15 and 0.22 mm respectively [20,21].The conditions of preparation and IEC of the membranes are given in Table 4. Membrane M-3 was selected due to its excellent IEC.

Physicochemical specifications like porosity, water content, swelling, and thickness were determined and are displayed in Table 6, and pertaining to its thickness and IEC membrane M-3 (0.15 mm thickness) was selected.

Table 1
Synthesis and IEC of Cerium(IV)Vanadophosphate ion exchange material (IEM)

S. No.	0.1M Orthophosphoric Acid (DMW) (ml)	0.1M Sodium (meta) vanadate (DMW) (ml)	0.1M Ammonium ceric nitrate (DMW) (ml)	pH	IEC $Meqg^{-1}$
S-1	50	50	50	1	1.95
S-2	**100**	**50**	**50**	**1**	**2.05**
S-3	50	100	50	1	1.25
S-4	50	50	100	1	0.9

Table 2
Synthesis and IEC of Cerium(IV)Vanadophosphate ion exchange material

S.No.	Sn(IV)arsenotungstate Inorganic ion exchanger (chloroform) (gm)	Pyrrole (gm)	FeCl3 (gm)	IEC meq/gm
P1	0.5	3	2.5	1.40
P2	1	3	2.5	1.55
P3	1.5	3	2.5	1.70
P4	2	3	2.5	2.05
P5	2.5	3	2.5	1.65

Table 4
Condition of preparation and IEC of Polypyrrole-Cerium(IV)Vanadophosphate IEM

Sample Code	Composites (gm)	Binder		Stirring time (hours)	IEC of membrane ($Meqg^{-1}$)
		Poly vinyl chloride(PVC)(gm)	THF (ml)		
M1	0.25	0.2	25	48	0.42
M2	0.50	0.2	25	48	0.35
M3	**0.75**	**0.2**	**25**	**48**	**0.74**
M4	1.0	0.2	25	48	0.51

Table 3
K_d values of some metal ions on Polypyrrole-Cerium(IV)Vanadophosphate composite in different solvent systems

Solvents / Metal Ions	0.1M HNO_3	0.01M HNO_3	0.001 M HNO_3	0.1M H_2SO_4	0.01M H_2SO_4	0.00 1 M H_2SO_4	0.1M HCl	0.01M HCl	0.001M HCl	DMW
Cu^{2+}	710	295	1985	1354	1945	980	1865	645	920	1350
Ni^{2+}	545	680	410	1150	850	715	695	980	610	945
Cr^{3+}	1055	4752	4385	1436	1935	4820	4255	1550	1258	3765
Pb^{2+}	1415	1270	2615	1482	1450	1500	1465	1265	1150	1365
Ba^{2+}	815	1650	1112	1350	1105	1105	915	840	1005	965
Cd^{2+}	915	620	1005	1065	570	710	745	495	545	655

Assembling of ion-selective membrane electrode

The membrane M-3 was positioned at the lower end of a Pyrex glass tube having an outer diameter 0.8 cm and inner diameter of 0.6 cm with araldite and left to dry at room temperature for 24 h. The glass tube setup was filled with 0.1M $Cr(NO_3)_2$ solution and kept at room temperature. Two SCEs were used: one in the tube in contact with the metal salt solution and other externally as reference. Schematic diagram of the assembly is given below:

Internal reference electrode (SCE) (satd)	Internal electrolyte [0.1M Cr^{3+}]	Membrane	Sample solution	External reference electrode (SCE) (satd)

Electrode response or membrane potential

The electrode potential room temperaturemeasured for a concentration range of 100 millimolar to 10^{-7} millimolar solutions of chromium nitrate was determined at a constant ionic strength as described by IUPAC Commission for Analytical Nomenclature [22]. The resultant values were plotted in a potential vs concentration curve and calibrated three times to ensure the accuracy and reproducibility of the system.

Potentiometric titration

The fabricated membrane was used as an indicator in the potentiometric titration of 10 millimolar chromium nitrate solution using EDTA and the results were plotted graphically.

Response time

Response time is measured by observing the EMF values of the electrodes dipped in desired solution. The membrane electrode was initially dipped in a 100 millimolar solution of the desired metal nitrate and then subsequently in the solution of the same salt but with a concentration ten times higher than the previous one, and the electrode was measured at t=0, t=5 and so on. The time taken by the electrode to establish a constancy was referred to as response time.

RESULTS AND DISCUSSION

Ppy-CVPnanocomposite ion-exchange materials (IEMs) showed IEC for Na^+ equal to 2.05 $meqg^{-1}$(Table 2). The IEC is seen to follow a reverse trend with respect to pyrrole monomer concentration. As the monomer concentration increases, IEC decreases.The selectivity of the prepared IEM with respect to various metal ions is depicted in terms of Kd values in Table 3. The Kd values are seen to be dependent on the composition and nature of solvents and hence it is evident that the IEM shows a higher adsorption for Cr^{3+}as compared to other ions. This exhibits two major characteristics of the IEM: adsorption and ion selectivity. Metal complexes formed in different solvents have different stability constants and hence different adsorption.

Different samples of Ppy-CVP IEM with varying amounts of the composite material viz. 0.25g, 0.5g, 0.75g and 1g were prepared using 0.2g of PVC as binder with each one of them. They were dissolved in 25ml THF as solvent and

the resulting membrane was examined for its stability, morphology and homogeneity, thickness etc. The observed values of ion exchange capacities are mentioned in Table 4.

Figure1 shows the SEM micrographs for prepared Ppy-CVP and Cr^{3+} absorbed Ppy-CVP composite IEM. The pure membrane is seen to be porous and dense while in the micrograph 1b definite chromium absorption can be seen in the IEM.

Physicochemical properties of the Ppy-CVP IEM are shown in Table 5. The membrane M-3 showed least swelling and water retention and maximum IEC and was selected for further investigations. Also, the physicochemical properties for M-3 depicts that the diffusion is supposed to occu majorly through exchanger sites.

Though using CVP as dopant in the Ppy-CVP IEM intensified the permselectivity, porosity (via cluster formation) and IEC of the membranes, it still maintained its mechanical as well as thermal stability

Figure 2 demonstrates the potentiometric response of Ppy-CVP over a concentration range of 1×10^{-10} M to 1×10^{-1} M; which is mostly linear. The extrapolation led to establishment of detection limit i.e. 1×10^{-9}M for Ppy-CVP IEM. So, the workable range for the prepared IEM M-3 was detected to be 1×10^{-7}M to 1×10^{-1} M for Cr(III).

Figure 1
SEM micrographs of (a) Polypyrrole-Cerium(IV)Vanadophosphate nanocomposite membrane and (b) Cr(III) adsorbed Polypyrrole-Cerium(IV)Vanadophosphate nanocomposite membrane (as prepared)

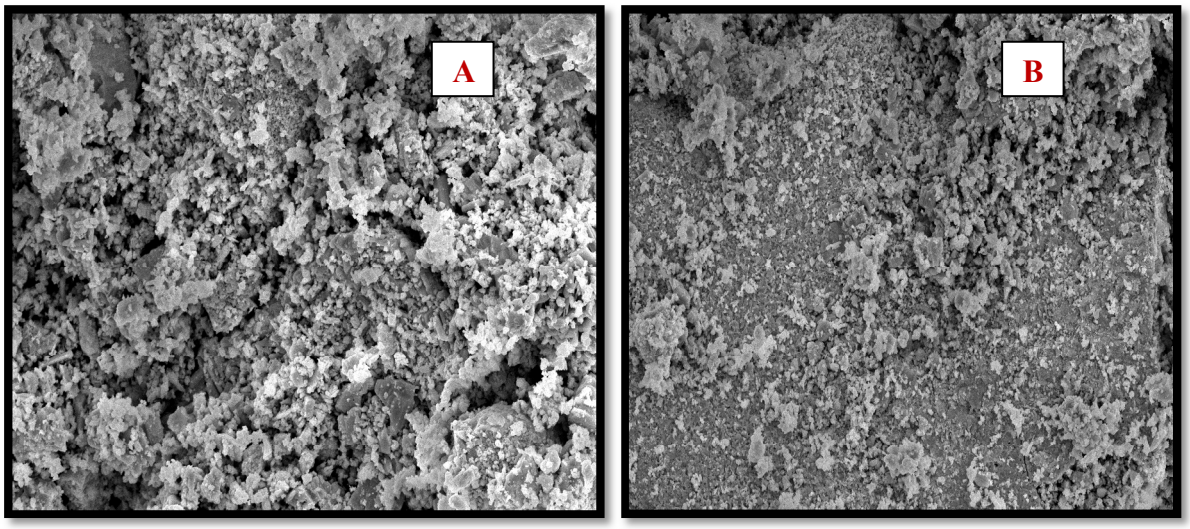


Table 5
Physiochemical Characterizations of Polypyrrole-Cerium(IV)Vanadophosphate ion exchange membrane

Sample Code	Thickness of the membrane (mm)	Porosity	Water content as % weight of wet membrane	Swelling
M1	0.21	0.0415	0.2345	0.054
M2	0.18	0.0695	0.2865	0.061
M3	0.15	0.0365	0.1065	0.028
M4	0.22	0.0510	0.3415	0.042

The effect of pH for the electrode with respect to a 10 millimolar solution of Cr(III) ions showed no appreciable change within the pH range of 5-8 as seen in Figure 3. This range is referred to as the working pH range of the membrane.

Figure 4 depicts the response time for a 10 millimolar solution of Cr(III) ion which can be clearly observed to be 25 seconds.

The reproducibility and reliability of the preprared Ppy-CVP IEM can be verified from the fact that it can be used upto six months without any noticeable change in its potential. In case of any potential drifts, the IEM can be re-equilibrated using 0.1 M $Cr(NO_3)_2$ solution for 3-4 days.

Figure 2
Calibration curve of Polypyrrole-Cerium(IV)Vanadophosphate nanocomposite membrane electrode in aqueous solution of $Cr(NO_3)_2$

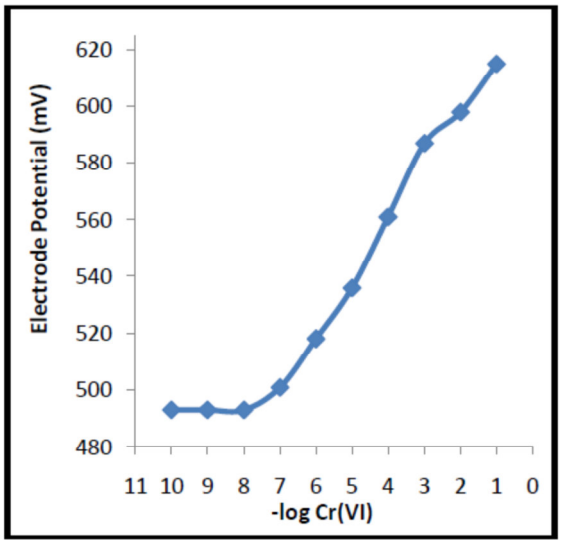


Figure 3
Effect of pH on the potential response of the Polypyrrole-Cerium(IV)Vanadophosphate composite ion exchange membrane electrode

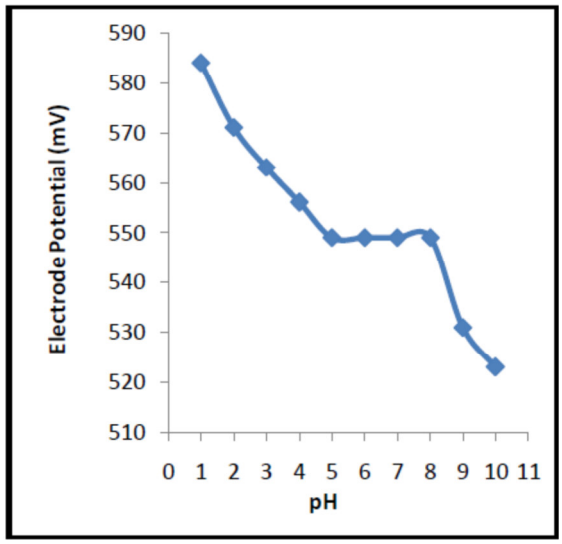


Figure 4
Time response curve of Polypyrrole-Cerium(IV)Vanadophosphate composite ion exchange membrane electrode at 1 × 10^{-1} M Cr^{3+} concentration

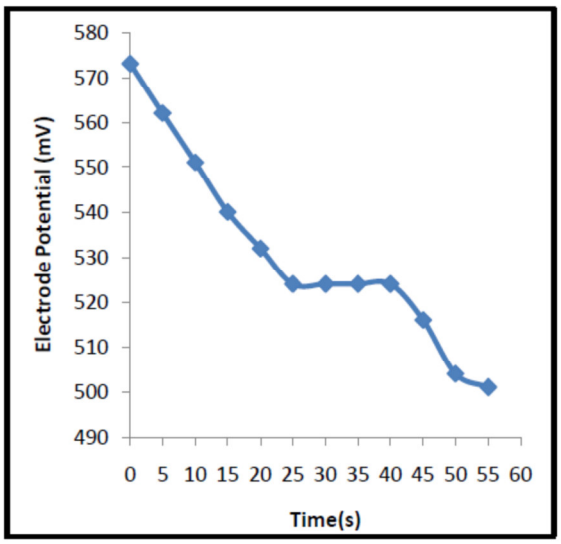
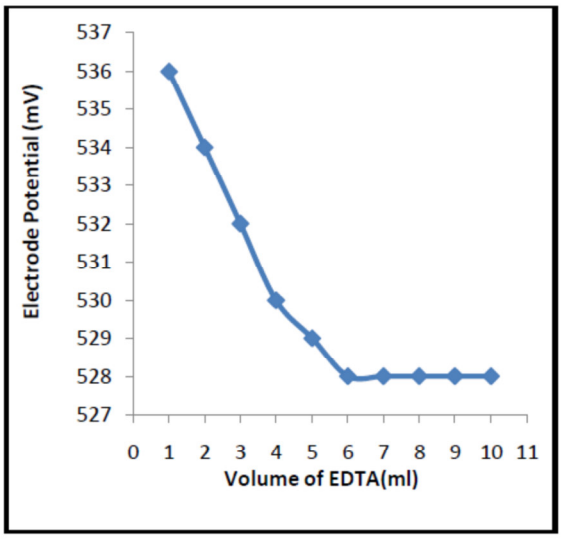


Figure 5
Potentiometric titration of Polypyrrole-Cerium(IV)Vanadophosphate nanocomposite membrane electrode at 1×10^{-2} M Cr(III) concentration



The prepared material shows an enhanced Cr(III) selectivity and hence can be used as an indicator for Cr(III) using EDTA as titrant. The potential vs volume (EDTA) graph in Figure 5 shows a diminishing slope which can be explained on the basis of formation of EDTA-Cr(III) complex.This study justifies the use of the Ppy-CVP membrane for various practical and analytical purposes.

Mixed Solution Method was used to determine the selectivity of the IEM. Table 6 clearly shows the highest value of selectivity for Cr(III).

Interfering ions (M^{n+})	Selectivity coefficients (K_{MSM})
Cr^{3+}	1
Ni^{2+}	1.41×10^{-2}
Cu^{2+}	1.63×10^{-2}
Pb^{2+}	1.74×10^{-2}
Cd^{2+}	1.92×10^{-2}
Ba^{2+}	2.06×10^{-2}
Mg^{+2}	2.15×10^{-2}

Table 6
The selectivity coefficient of various interfering ions for Cr^{3+} selective Polypyrrole-Cerium(IV)Vanadophosphate composite cation exchanger membrane

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CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-14

SYNTHESIS OF NANOSTRUCTURED INTERMETALLICS THROUGH SOLID-STATE REACTIONS

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ABSTRACT

A combination of X-ray diffractionand DC magnetization has been used to study the magnetic properties of 5h and 10h mechanically alloyed Fe-25 at.%Al using high energy ball milling. These studies show that while alloying is not complete even after 10h of milling, in addition to unalloyed Fe, a magnetically hard, Fe-Al phase emerges after 10h of milling which co-exists with a paramagnetic phase due to formation of non-magnetic, Al-rich Fe-Al phases.

KEYWORDS:

INTRODUCTION

An alloy is a homogeneous mixture of two or more elements, at least one of which is a metal, where the resulting material has metallic properties. The resulting metallic substance usually has different properties from those of its components. Alloys are usually prepared to improve properties of other elements. The physical properties of an alloy such as density, reactivity, Young's modulus, electrical and thermal conductivity and engineering properties, such as tensile strength and shear strength can be different from those of the constituent materials. This is sometime due to the different size of the atoms in the alloys. Most alloys do not have a single melting point instead they have melting range in which the material is a mixture of solid and liquid phases.

Early application of the mechanical alloying technique was mainly confined to produce alloys. However with advancement in milling techniques, high energy ball milling is a well-established technique that has become popular in recent years for the synthesis of nanostructured intermetallic alloys through solid-state reactions. A high energy ball mill can be used either for mechanical milling (MM) or for mechanical alloying (MA). In the MM process, an alloy prepared by other methods is subjected to high energy ball milling so that the size of the crystallites decreases. This is accompanied by the production of a high density of defects in the alloy. In the MA process, a stoichiometric mixture of elemental metal powders is subjected to high energy milling, which leads to alloying of the powders. In both the cases, the repeated impacts between balls and between balls and the vial wall cause plastic deformation, fracture and cold welding of the powder particles trapped at the collision points. In MA, this leads to the formation of composite particles, whose structure becomes finer with continued milling. In many systems, once the structure becomes sufficiently fine, solid state reactions between the starting phases are activated during milling, leading to mechanical alloying.[1, 2]

In MA/MM, the metallic powder is placed in a container (the vial), along with suitable grinding media under inert or controlled atmosphere. Typical grinding media used include hardened steel balls, stainless steel balls, tungsten carbide balls and ceramic balls. The vial is then placed in the ball milling machine to start the milling process. The ball-to-powder ratio and the time for which the powder is milled can be chosen to suit the studies that are planned.

The MA/MM process has been widely used to produce alloys, amorphous materials, nanostructured materials and extended solid solutions. However, many factors such as the dynamics of milling media, evolution of microstructure and the formation of different metastable and stable phases during the process has still not been well understood since there are many factors that affect the ball milling process. These factors include the number and size of balls, density of ball material, ball to powder weight ratio and ball to powder volume ratio.[3]

However, it is now generally accepted that the continuous fracturing and welding of particles due to shock and friction during the alloying process leads to a continuous refinement of the crystallites, yielding nanometric structures with clean surfaces at the atomic level.[4] When these surfaces are brought into contact during the MA process, new metastable and/or stable phases are formed. The MA process also leads to the formation of extended solid solutions, with grain sizes on the order of a few nanometres. Due to the nanometric size of the grains, a large number of atoms are expected to reside at grain boundaries and surfaces. These atoms play a dominant role in determining the

mechanical and magnetic properties of the system.[5] Hence, the nanocrystalline state obtained through the MA process is usually a complex one and exhibits interesting physical and magnetic properties. Due to these reasons, a large number of studies[6] have been made on MA and MM systems using different types of ball mills and milling media.

There are four types of milling machines which are widely used for MA- attritor mill, conventional horizontal ball mill, vibratory ball mill and planetary ball mill. A vibratory mill operates by agitating one or more small grinding vials at a high frequency in complex cycles. This type of mill is suitable for research purposes since small quantities of powders can be processed in a controlled atmosphere using this mill. The SPEX 8000 M mixer/mill which is used in the present study is also a vibratory mill, which has a fixed speed of 1080 rpm (Figure 1).

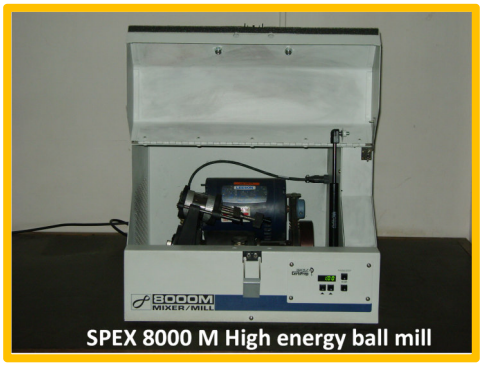

Figure 1 SPEX 8000 M high energy ball mill (M. L. Sukhadia University, Udaipur)

In the present study, nano sized Fe-Al alloy have been synthesized by mechanical alloying by high energy SPEX ball milling and studied by X-ray diffraction (XRD) and DC magnetization.

EXPERIMENTAL

Nano-sized Fe-Al alloys with a nominal composition corresponding to Fe-25 at.%Al were prepared by weighing out elemental powders in the required ratios and then mechanically alloying them in tungsten carbide (WC) vials and balls with a ball to powder ratio 20:1. WC vials and balls were chosen to prevent contamination from the milling media.

The Stoichiometric calculations are as follows:

- Molecular weight of Iron (Fe) =55.84 g
- Molecular weight of Aluminum (Al) =26.982 g
- 1 gm mole of Fe3Al is equivalent to = 3*55.84+7*26.982 = 194.517g
- Mass of 8 tungsten carbide balls =31.242g
- Mass of Fe in 194.517g=167.535g
- Mass of Al in 194.517g =26.982g
- Quantity of Fe in 1g Fe_3Al =0.862g
- Quantity of Al in 1g Fe_3Al =0.139g
- Mass of sample for ball to powder ratio = 20:1 = 31.242/20 = 1.5621 g
- Amount of Fe to be weighted =1.5621*0.861= 1.369g
- Amount of Al to be weighted =1.5621*0.139=0.2171g

Stoichiometric and high purity Fe and Al powders were first mixed in an agate mortar and pestle and then ball- milled for different periods (SPEX 8000M mixer/mill) using tungsten carbide vials and balls. Eight balls per vials were used and ball to powder weight ratio was fixed at 20:1. Bulk magnetic parameters of unmilled and samples milled for 5 h and 10 h were obtained at room temperature (RT) using LakeShore 7300 VSM. Structural properties, average grain sizes, density of material and lattice constant a_0 were determined by XRD. Densities were also experimentally confirmed using the standard relative density method.

RESULTS AND OBSERVATIONS

Experimental determination of density/porosity by relative density method and Structural Analysis by X-Ray diffraction

(a) Density measurement for 5h Milled Fe-Al

- Weight of sample M_S =0.493g
- Weight of bottle + cork=18.332g

- Weight of bottle+cork+acetone=26.263g
- Weight of acetone M_1=26.263-18.332=7.931g
- Weight of bottle +cork +remaining acetone + sample = 26.667g
- Weight of bottle +cork + remaining acetone = 26.667 - 0.493 = 26.174g
- Weight of remaining acetone M_2=7.842g
- Weight of displaced acetone M_A (M_1-M_2) = 0.089 (7.931-7.842)g
- Density of acetone ρ_A (M_A/V_A)= 0.79g/cm^3
  Where, V_A is the volume of displaced acetone
- V_A (M_A/ρ_A) = 0.11266cm^3

By Archimedes principle: Volume of displayed acetone (V_A) = volume of sample (V_S)
∴ Density of sample $\rho_S = M_S/V_S$ =4.376 g/cm^3

(b) Density measurement for 10 h Milled Fe_3Al

- Weight of sample M_S = 0.494g
- Weight of bottle + cork = 18.332g
- Weight of bottle + cork + acetone = 26.254g
- Weight of acetone M_1 = 26.254-18.332 = 7.922g
- Weight of bottle +cork remaining acetone + sample = 26.668g
- Weight of bottle + cork + remaining acetone = 26.668-0.494 = 26.174g
- Weight of remaining acetone M_2 = 7.842g
- Weight of displaced acetone M_A (M_1-M_2)= 0.08 (7.922-7.842)g
- Density of acetone ρ_A (M_A/V_A)= 0.79g/cm^3
  Where, V_A is the volume of displaced acetone
- V_A (M_A/ρ_A) = 0.11266 cm^3

By Archimedes principle: Volume of displayed acetone (V_A) = volume of sample (V_S)
∴ Density of sample $\rho_S = M_S/V_S$ =4.878 g/cm^3

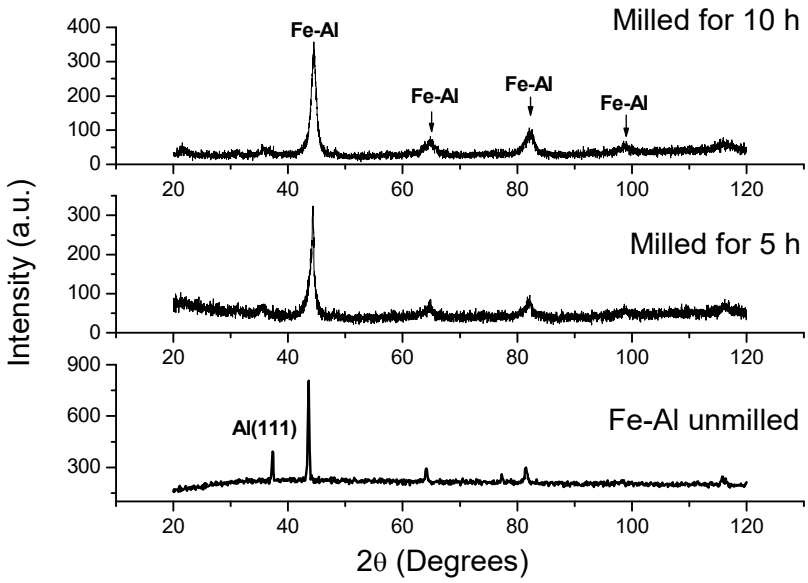

Figure 2 The XRD spectra of the unmilled and milled samples.

Fig.1 gives the XRD spectra of the unmilled and milled samples. As Fe and Al both have overlapping peaks except for the Al (111) peak which is both intense and distinct, the intensity of this peak is monitored to check for alloying. A comparison of the XRD of unmilled, 5h and 10 h milled samples show that on milling, the distinct, characteristic Al(111) peak intensity becomes low indicating that Al has formed an alloy with Fe. The 5 and 10 h milled samples show the presence of characteristic Fe-Al alloy peaks in the XRD spectra (Figure 1). The peaks are also broadened due to grain refinement and possibly strain. Lattice constants a_0 for the milled samples are nearly the same, with a slight decrease for the 10 h milled sample. This decrease can be attributed to better alloying of Fe and Al.

Calculation of theoretical density by X-Ray diffraction:

The standard formula[7] for X-ray density is:

$$\rho_X = \frac{1.66042 * N\Sigma M}{a_0^3}$$

Where, ρ_x is density of sample by X-ray method, *N* is number of formula units per unit cell ΣM is Molecular weight of sample a_0= lattice parameter.

In the present sample, i.e. Fe-Al, there are 4 formula units per unit cell, thus, ΣM = (3*55.85+1*26.98) = 194.53 g/mole, *N* = 4, $\therefore N\Sigma M$ =1292.006 g/mole.

(a) a_0 for 5 hr milled Fe_3Al= 5.768 Á $\therefore$ ρ_X = 6.729 gm/cm^3
(b) a_0 for 10 hr milled Fe_3Al=5.750 Á.$\therefore$ ρ_X = 6.795gm/cm^3
Calculation of Porosity:

$$\text{Porosity} = \left[1 - \frac{\rho_s(measured)}{\rho_x(calculated)}\right] * 100$$

(a) Porosity for 5 hr milled Fe_3Al is 34.96
(b) Porosity for 10 hr milled Fe_3Al is 28.02

Average Particle Size determinationUsing Debye-Scherrer formula

$$\text{Average particle size} = \frac{0.9 * \lambda}{\beta \cos \vartheta}$$

λ = wave length of X-Ray (Cu Kα) = 1.541 Á
β = the full width at half maximum of the sample XRD peak at Bragg angle θ
The peak at 2θ = 44.99^0 (Bragg angle) was chosen since this peak is the most intense.
So, average particle size for the 10 h milled sample is

$$\frac{0.9*1.541}{\pi/180*1.0426*\cos(44.99)}\ \text{Á}$$

$$= \frac{1.3869}{0.01818 * 0.7072}\ \text{Á} = 107\text{Á} = 10.7\ \text{nm}$$

Correspondingly, the average particle size for the 5 h milled sample is =133 Á =13.3 nm
Correspondingly, the calculated X-ray density increases by 1 % for the 10 h milled sample by w.r.t the 5 h milled sample. Experimental determination of densities for the two samples show that it is much less than the theoretical one (as mentioned before). This is attributable to the considerable porosity present in the two samples as is expected for nano-sized samples.

Magnetization Studies by VSM:

From figure 2, which gives the M-H loops for the unmilled, 5 h and 10 h milled samples, it is clear that the 10 h milled sample shows the optimum magnetic properties in terms of coercivity, retentivity and saturation magnetization. On milling for 5 h, alloy formation has started resulting in a decrease in the M_s. Further milling increases the Fe-Al phase which is magnetic as seen in the enhancement of overall magnetic parameters (figures 3 and 4).

A careful examination of the M-H loops also shows that they are not truly saturated. This can be attributed to the presence of a paramagnetic phase along with the magnetic Fe-Al magnetic phase. The loops have thus been fitted with a Brillouin function $F(H) = \frac{2M_s}{\pi}\tan^{-1}\left[\frac{H \pm H_C}{H_C}\tan\left(\frac{\pi S}{2}\right)\right]$[8]and the contributions separated (figures 3 and 4).

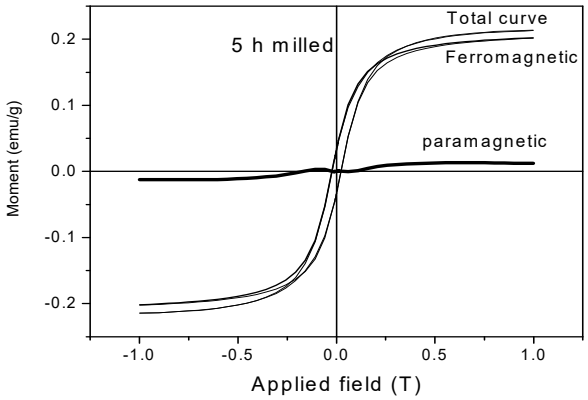

Figure 3 Final fitted spectra of 5H milled Fe_3Al

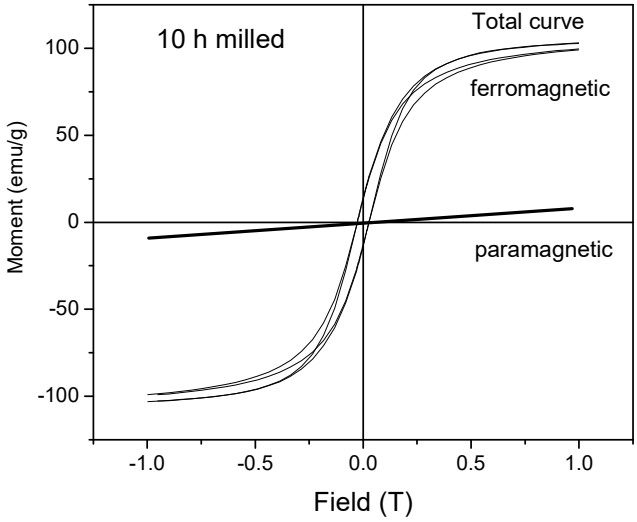

Figure 4 Final fitted spectra of 10H milled Fe_3Al

Figure 5 gives the dependence of magnetic parameters for the alloys as a function of milling time.

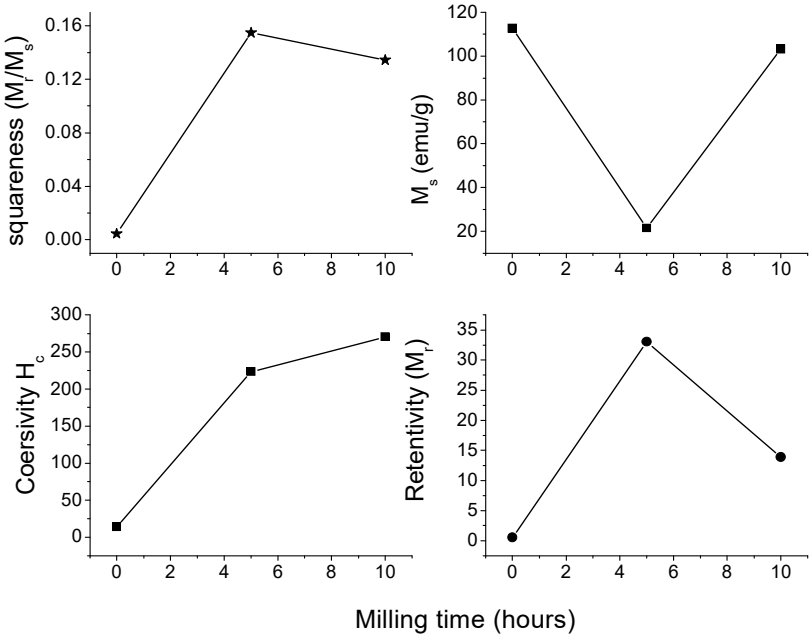

Figure 5 Variation of H_c, M_r, Squareness (M_r/M_s) and M_s with milling time

From figure 5 it is observed that the Squareness factor and coercivity increase on milling. This is because of the emergence of a magnetically hard Fe-Al phase. In comparison, in the unmilled sample, the only magnetic phase is that due to pure Fe which is very soft, although it has high saturation magnetization, the retentivity and coercivities are very little. The increase in coercivity is due to the small sizes since on a decrease in the grain size, the domain walls

become thinner. Thus a larger force in terms of higher magnetic fields, which is the coercive field is required to demagnetize the sample.

CONCLUSIONS

- Considerable porosity is present in the nano-sized samples as is evident from the difference in the theoretically calculated and experimentally measured densities.
- Grain refinement and alloying leads to the emergence of a magnetically harder phase as shown by the DC magnetization curves.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-15

A STUDY OF EFFECTS OF MICROBS ON EMULSION COPOLYMERS [4-N-PHENYLETHANAMIDE AZO-3-N-(4-BROMOPHENYL) MALEIMIDE AND N-[{4-(N'-BENZENESULPHONICACID) AMINO-CARBONYL}-3-CHLOROPHENYL] MALEIMIDE: SYNTHESIS AND CHARACTERIZATION

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ABSTRACT

Imido class is the multi-functional class and naturaly it has some microbiological features to give attention towards studies. For this objective, imido-group containing maleimide-polymeric structures of [4-N-Phenylethanamideazo-3-N-(4-bromophenyl) maleimide [em-PABMI] and N-[{4-(N'-benzenesulphonicacid) amino-carbonyl}-3-chlorophenyl]maleimide[em-BSACChPMI] synthesized byconventional method. Copolymerization was done by using acrylic acid (AA) as a comonomer for both compounds, via an efficient and effective emulsion polymerization procedure to form an emulsion of copolymers. In this process,both monomer] were firstly prepared by using maleic anhydride as a brick unit and other suitable and needful reagents were used and copolymers [em-CPABMI] and [em-BSACChPMI]were synthesized using aqueous free radical initiator. The structures of monomer and copolymers were confirmed by FT-IR, 1H-NMR spectroscopy. Antimicrobial activities were also performed to analysis polymer's specialty and their significances.

Keyword: Polymeric structure, Copolymerization, Maleic anhydride, Acrylic acid, Antimicrobial activities.

INTRODUCTION

Maleimide and their polymers, It have been a great interest to developed a variety of high performing synthetic materials which accumulated by a chemically generated route to form olefinic-imide five membered frame, which is further treated with different derivatives of amines to form maleimide compounds [1-3]and modified to achieved multifunctionalities in N-substituted maleimide polymers[4-7]. N-substituted maleimides and derivatives with acrylates have been extensively used in polymerization reactions to formed thermally stable, high performing synthetic materials such as high strength composites, molding composites, adhesives and also production of superabsorbent polymers and microbial resist and coated polymeric materials [8-12] and water absorbent polyacrylic acid polymer. Copolymers containing maleimide synthesis were attempt by many researchers in last year's using different types of variants in comonomers moiety to launch high performance polymers.
Maleimide polymers were mostly synthesized by customized method as bulk polymerization[13-19]. In few examples of research, a new technique of emulsion polymerization method are used to synthesize polymers to overcome of drawbacks of bulk polymerization processes[20,21]. The emulsion polymerization technique are known as "products in semi-liquid" whose main properties are determined during polymerization process. In this sequence, emulsion polymerization method is enhanced the opportunities to increases uses of emulsions and favorablegreen environment and the target is to achieve an more efficient product of high-quality performing materials with consistence's of antimicrobial properties.

The present research deals with the synthesis of emulsion copolymerization of [4-N-Phenylethanamide azo -3-N-(4-bromophenyl) maleimide [em-CPABMI]and N-[{4-(N'-benzenesulphonic acid) amino-carbonyl}-3-chlorophenyl]maleimide [em-BSACChPMI] with acrylic acid used as a comonomer, unsaturated unit for addition type polymerization.

MATERIALS AND METHODS

Maleic anhydride, P-amino acetanilide, were recrystallized from acetone (Loba Chemei, AR). AIBN (Fisher Scientific, AR), 4-bromo aniline, 4-amino-3-chlorobenzoic acid, 4-amino sulphanilic acid, thionyl chloride, THF, DMF and methanol (Sigma Aldrich, AR) and acrylic acid (Spectrochem, Mumbai) were used without any purification.

Experiments

a. Synthesis of monomer[4-N-Phenylethanamide Azo -3-N-(4-bromophenyl) maleimide [PABMI]:

A monomer of [4-N-Phenylethanamide azo-3-N-(4-bromophenyl) Maleimide [PABMI] was synthesized according to previously described in published procedure [22].

Emulsion Copolymerization

b. Synthesis of emulsion copolymer [4-N-Phenylethanamideazo-3-N-(4-bromophenyl) maleimide-co-acrylic acid [em-CPABMI-AA]:

Firstly prepared an aqueous solution of sodium Lauryl sulphate (0.06 M) in a 100 ml three necked flask equipped with a stirrer, a thermometer, a condenser and it was stirred for 30 min. then add drop wised monomer [PABMI] solution prepared in very small amount of DMF. Polymerization was proceed by using acrylic acid as an unsaturated based comonomer to give addition typed copolymerization. Acrylic acid were gradually added at 75-80°C and stirred for two hours. After that, the potassium per sulphate ($K_2S_2O_8$) was used as an aqueous soluble free radical initiator and stirred again for 2 hours. Resultant, copolymer was formed inmicelleous state and the final product is isolated from this micelle by 'breaking' the micelle-molecules. For this, added 2% Al_2SO_4 solution to get precipitation. The precipitate was filtered, washed and dried under a vacuum. Theproducts were recrystallized by methanol and dried again under a vacuum. The conversion ratios for the monomer into copolymer was over 85 % - 90%.

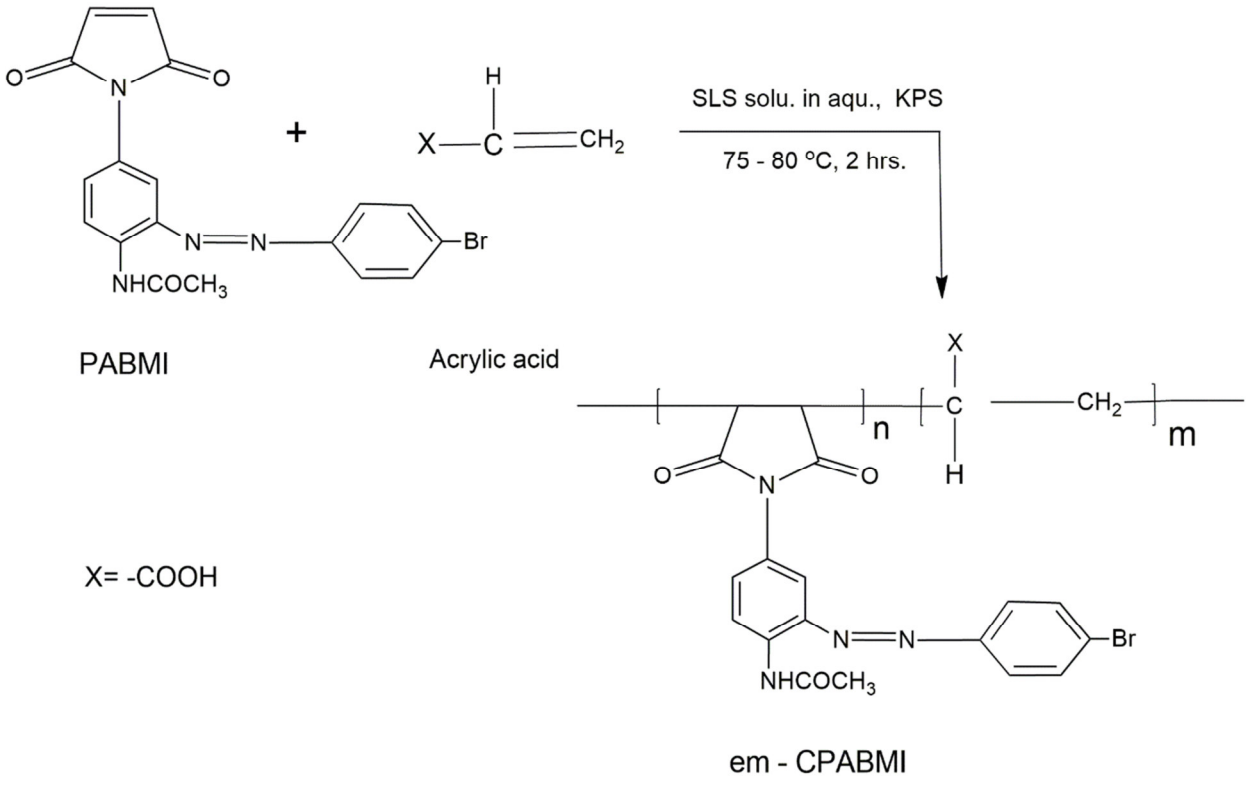
c. Synthesis of monomer [N-[{4-(N'-benzenesulphonicacid) amino-carbonyl}- 3-chlorophenyl][BSACChPMI]: monomer was synthesized by using maleic anhydride (0.01 mol) and 4-amino benzoic acid (0.01 mol). These reactants were dissolved in DMF and stirrer for 3 hours at room temperature then 0.03 g P_2O_5 and 10 ml conc. H_2SO_4 mixed in same solution and stirred continuously at 70 ^oC for 4 hours. The dark yellow coloured solution was precipitated in ice-water. The precipitate was filtered,washed and dried. In next step, this solid powder (0.01 mol) was refluxed with thionyl chloride (50 ml) for 4 hours and dried by air till that smell of thionyl chloride was gone and washed, dried and treated with 4-amino sulphanilic acid (1:1 ratio) in THF solvent at 40 ^oC for 4 hours. The dark pale-yellow coloured precipitate obtained in ice-water, filtered and recrystallized from 2-propanol and dried in vaccum oven at 40 ^oC for 8-10 hours.

d. Synthesis of emulsion copolymer [N-[{4-(N'-benzenesulphonicacid) amino-carbonyl}- 3-chlorophenyl] maleimide-co-acrylic acid [em-CBSACChPMI-AA]:

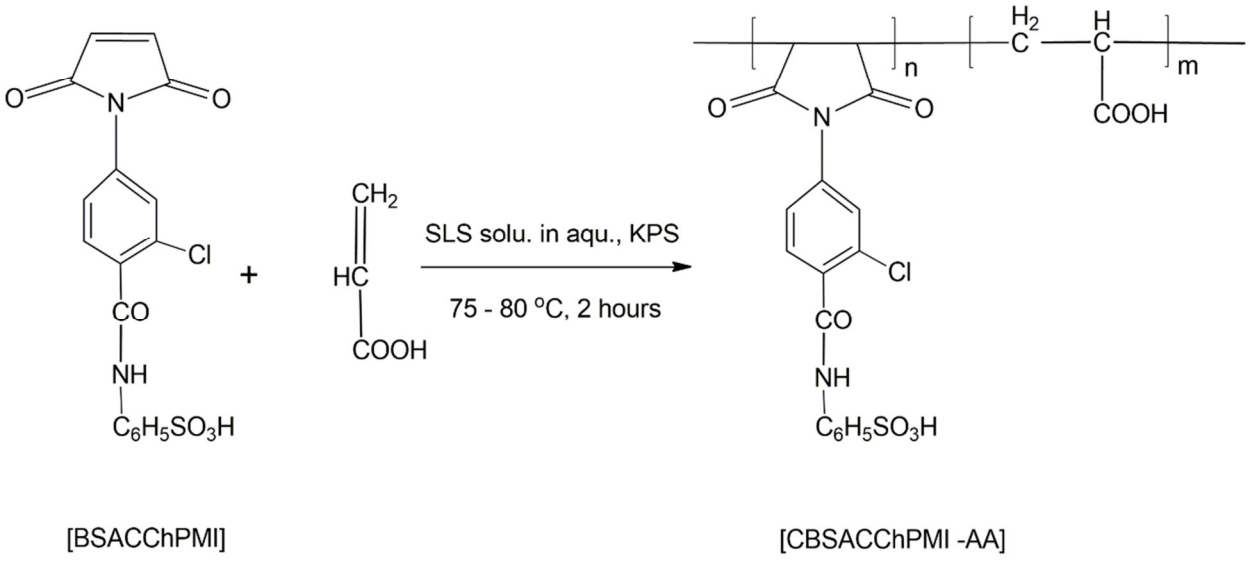
For the emulsion copolymerization of [em-CBSACChPMI], followed the same procedure b [em-CPABMI-AA] to synthesis of copolymer [em-CBSACChPMI]. Resultant product of copolymer was 88%-90%.

INSTRUMENTATION

FT-IR spectra were screened out from perkin-Elmer spectrometer mode RX-I FTIR equipped with a high purity dried KBr pellets as beam splitter at room temperature. The 1H-NMR spectra was obtained using a Bruker Avance II 400 MHz NMR spectrophotometer with TMS as an internal standard reference.



Scheme 1: ***Synthesis of emulsion copolymer of [em-CPABMI-AA]***



Scheme 2: ***Synthesis of emulsion copolymer of [em-CBSACChPMI-AA]***

CHARACTERIZATION

1. Monomer 4-N-Phenylethanamide azo-3-N-(4-Bromophenyl)Maleimide [PABMI]-
Yield 87%, melting point 148-50 oC; color dark brown, FT-IR (KBr): 1704 cm-1 (C=O),3300 cm-1 (N-H), 3095 cm-1 (CH=CH, C-H Stre.), 1602 cm-1(C=O, amide), 1666 cm-1(CH=CH, C-C Stre.), 1372 cm-1(C-N-C), 1532 cm-1(N=N), 516 cm-1(Ar-Br), 837 cm-1 and 711cm-1(Para, Ortho); 1H-NMR(CD3OD): 7.22-7.69 (Aromatic), 6.96-7.20 (HC=CH of Maleimide), 7.68 (Ortho-H of N=N-Ar), 7.67 (Meta –H of N=N-Ar), 10.06 (CO-NH).

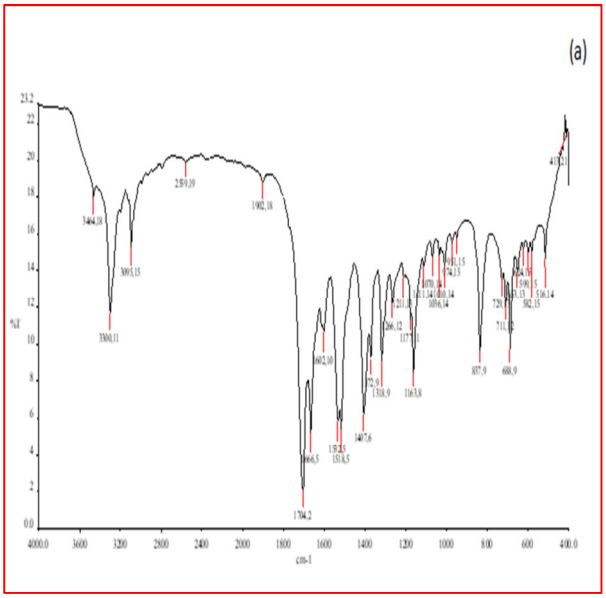
2. Copolymer [4-N-Phenylethanamide azo-3-N-(4-bromophenyl)Maleimide-co-Acrylic acid][em-CPABMI-AA]-
Yield 80 %, melting point 193-95 oC; color dark brown, FT-IR (KBr): 1707 cm-1 (C=O), 3353 cm-1 (N-H), 3069 cm-1 (CH=CH, C-H Stre.), 1605 cm-1(C=O, amide), 1398 cm-1(C-N-C), 1515 cm-1(N=N), 526 cm-1(Ar-Br), 834 cm-1 and 744 cm-1(Para, Ortho); 1H-NMR(CD3OD): 7.15-7.66 (Aromatic), 6.65-7.14 (HC=CH of Maleimide), 8.12 (Ortho-H of N=N-Ar), 8.19 (Meta –H of N=N-Ar), 3.69 {(CH-CH-)n}, 10.43 (CO-NH).

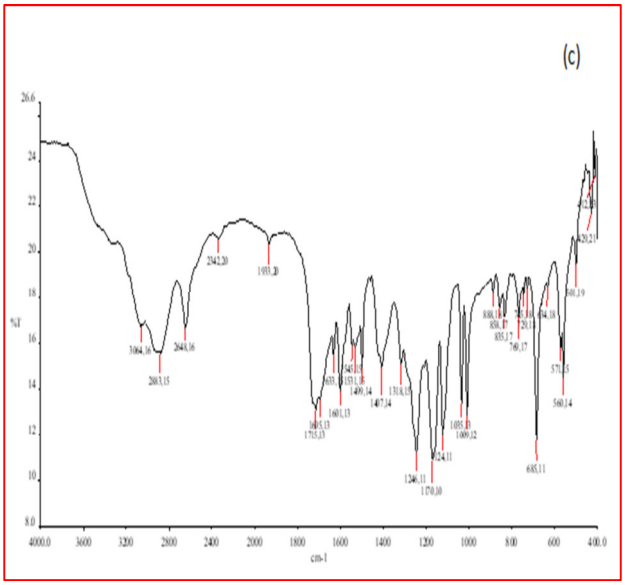
3. Monomer N-[{4-(N'-benzenesulphonicacid) amino-carbonyl}-3-chlorophenyl] maleimide [BSACChPMI]–
Yield 87%, melting point 156 oC; color yellow brown, FT-IR (KBr): 1715 cm-1 (C=O), 3064 cm-1 (N-H), 2883 cm-1(-OH) 1601 cm-1(C=O, amide), 1633 cm-1(CH=CH, C-C Stre.), 1318 cm-1(C-N-C), 1095, 1009 cm-1(S=O); 1H-NMR(400 MHz, CD3OD, DMSO): 7.19-7.76 (Aromatic), 0.96-1.90, (HC=CH of Maleimide), 10.06 (CO-NH), 2.53 (SO3H) (ppm).

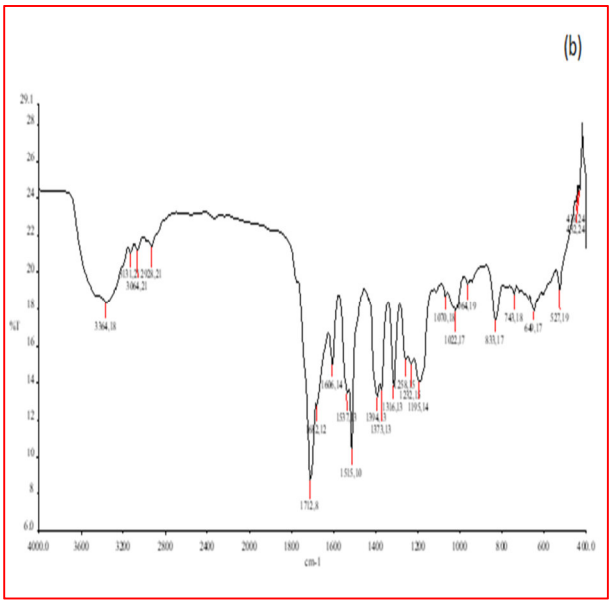
4. Copolymer [N-[{4-(N'-benzenesulphonicacid)amino-carbonyl}-3-chlorophenyl]maleimide-co-acrylicacid [em-CBSACChPMI-AA]–
Yield 70%, melting point 241 oC; color yellow brown, FT-IR (KBr): 1718 cm-1 (C=O), 3065 cm-1 (N-H), 2983 cm-1(-OH) 1600 cm-1(C=O, amide), 1501 cm-1(CH=CH, C-C Stre.), 1388 cm-1(C-N-C), 1095, 1009 cm-1(S=O); 1H-NMR(400 MHz, CD3OD, DMSO): 7.18-7.96 (Aromatic), 1.26-2.63, (HC=CH of Maleimide), 9.84 (CO-NH), 2.57 (SO3H) (ppm).

Figure 1

FTIR spectra of (a) [PABMI] monomer (b) [em-CPABMI-AA] copolymer (c) [BSACChPMI] monomer (d) [em-BSACChPMI-AA] coplymer







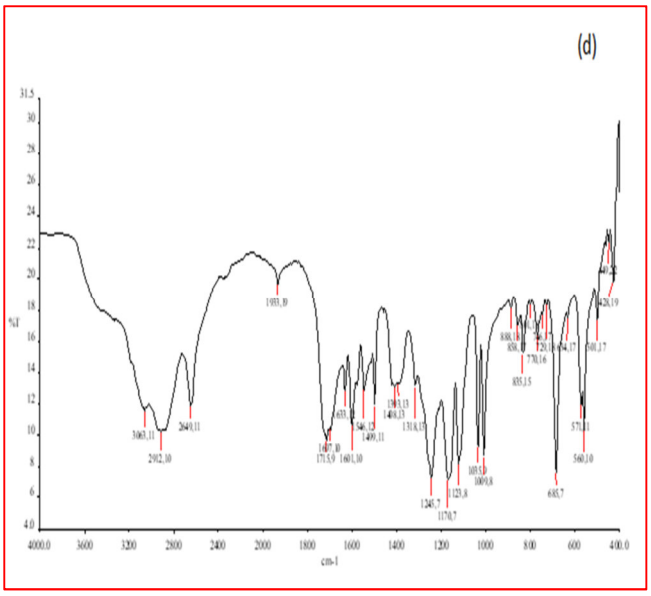
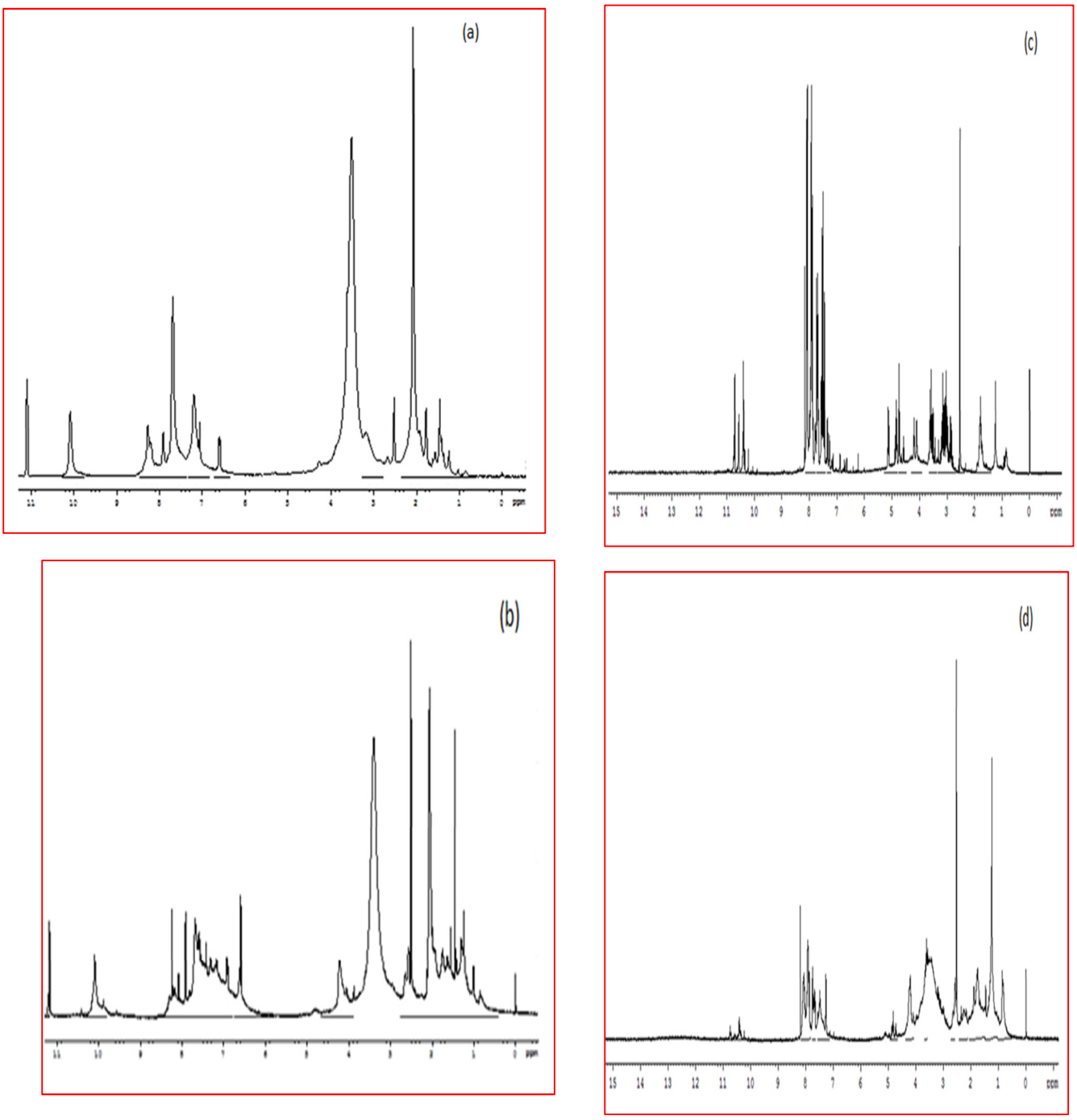


Figure 2

1H-NMR spectra of (a) [PABMI] monomer (b) [em-CPABMI-AA] copolymer (c) [BSACChPMI] monomer (d) [em-BSACChPMI-AA] coplymer



MICROBIAL EVALUATION

Due to the good special features of used functional groups in synthesized maleimide compounds as sulfur, nitrogen, chlorine against microb's growth. In this sequences to explore, the utility of synthesized polymersin term of microbial performances, have been examined on some pathogenic bacterial and fungal environment. The antibacterial activities were carried out against bacteria ***Esherichia coil, P.aerogenosa, Esherichia aerogenes, Staphylocous aureus*** with 500 micrograms in concentration for 24 hours durations. According to results, all synthesized polymers showed good resistance against the microb's growth.

Antifungal activities were observed against ***Aspergillus nizer , Aspergillus flavus, Alternaria solani, Candida albicans***. Old fungal culture (48 hours) inoculated into nutrient broth and incubated for 48 hours at 37 ± 2^0C in an incubator. Petri plates were prepared with Potatodextrose agar (PDA) media (25%). Different concentrations of standard drug and synthesized polymers along with control (DMSO as a solvent) introduced in petri plates and placed in a refrigerator at10^0 C for 1-2 hour for proper diffusion of all compounds. After 2 hours, the petri plates were referred to incubator and maintained at 37 ± 2^oC for 24-36 hours.

All polymer's concentration was used in 500 micrograms. All synthesized polymers results were compared with *streptomycin* as antibacterial standard drug and*Griseofulvin*as antifungal standard drug to evaluated growth fractions of microbs in provided polymeric environment.

Among all the polymers, sulfur and chlorine containing copolymer showed good antimicrobial properties due to the presence of sulfur and chlorine functional groups and in the another face, the acrylic acid group used as comonomer, bearing oxygen atoms to favour the bacterial growth but the overall results were loved the antimicrobial performances. So conclusion of the experiments as [em-CPABMI-AA] and [em-CBSACPMI-AA] were showed excellent antibacterial and antifungal performances.
The order of toxicity of these polymers for microbes is; [em-CBSACChPMI-AA] > [em-CPABMI-AA]

Table 1

Screening of antibacterial activity against copolymers [em-CPABMI-AA] and [em-CBSACChPMI-AA]

Compounds	Zone of Inhibition (in mm)			
Microb's species	***Esherichia coil***	***P. aerogenosa***	***Esherichia aerogenes***	***Staphylocous aureus***
Streptomycin (SD)	27	24	22	25
[em-CPABMI-AA]	18.1	20.2	16.4	17.5
[em-CBSACChPMI-AA]	24.7	20.3	21.6	22.4

Table 2

Screening of Anti-Fungal Activity against copolymers[em-CPABMI-AA] and [em-CBSACChPMI-AA]

Compounds	Zone of Inhibition (in mm)			
Microb's species	***Aspergillus nizer***	***Aspergillus flavus***	***Alternaria solani***	***Candida albicans***
Griseofulvin (SD)	26	23	20	22
[em-CPABMI-AA]	20.5	18.5	19.5	21.4
[em-CBSACChPMI-AA]	25.2	22.3	18.5	19.8

CONCLUSION

Two monomers and two different copolymers [4-N-Phenylethanamide azo-3-N-(4-bromophenyl)Maleimide-co-Acrylic acid] [em-CPABMI-AA] and [N-[{4-(N'-benzenesulphonicacid)amino-carbonyl}-3-chlorophenyl]maleimide-co-acrylic acid [em-CBSACChPMI-AA] have been successfully synthesized and characterized. The use of phosphoruspentaoxide (P_2O_5) as a catalyst has decreased the reaction temperature and reaction time from 300 ^oC to 75-80 ^oC for the preparation of monomer and use of KPS ($K_2S_2O_8$)generate free radical in aqueous medium to promote the emulsion polymerization reaction at suitable temperature for 2 hours.In de-emulsification of copolymers, the calculated product yields werefound high as compared to bulk copolymerization process[23]. [These monomers and polymers were characterized to confirm their structures through FTIR and 1H-NMR. The antimicrobial performances were examined by different pathogenic bacterial and fungal species and results were favored to generate microbial resistance environment and these copolymers can be suggest to use in antimicrobial polymeric appliances, which is worked at room temperature or below to room temperature as storages and packaging devices and articles.

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CONFLICT OF INTEREST

Conflict of interest declared none**.**

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SP-16

ANALYSIS OF MICROSTRIP PATCH ANTENNA AS A SENSOR WITH THE HELP OF DIFFERENT TECHNIQUES: A REVIEW

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ABSTRACT

The microstrip moisture sensor is very useful for measuring the moisture of rice, wheat, soil, etc. It can be measured at different frequencies with the help of different techniques. The coaxial feed techniques will be used for designing the microstip antenna it is very easy to feed and low spurious feed radiation and measured by the vector network analyzer and discussed the all techniques related to moisture content.

KEYWORDS:microstrip antenna, moisture content, CST, vector network analyzer.

INTRODUCTION

Agricultural biomaterials are materials consisting of organic and inorganic inclusions along with water. Oil seeds form a major constituent of the agricultural and food sector [1-4]. The agricultural application of microwaves, particularly crop growth studies like classification, mapping of various crops, monitoring of crop growth parameters, leaf area index, moisture content, dry matter production are very important aspect [5-7].

At microwave frequencies, dielectric properties of bio vegetation are primarily a function of frequency, water saturation, porosity, texture, component geometry and electrochemical interactions [8-11]. Microwave techniques and instrumentation can be utilized in agriculture to improve the efficiency of the crop production, handling and processing, and improve the quality of the products [12].

Generally in this configuration, microstrip line will be placed on lowersubstrate and the patch element will be placed on the upper substrate. Other name forthis feeding is electromagnetically coupled feed [13-14]. The feed method are important in microstrip antenna, co-axial feed technique is easy, low spurious feed radiation and easy to fabricate.

A slot will be placed onthe ground plane and feed line will be placed on lower substrate. This will beelectromagnetically connected to patch on the upper substrate through the groundplane slot [15].

MICROSTRIP PATCH ANTENNA

Microstrip patch antenna designed of three parameters such as ground, patch, and substrate. The different types of substrate such FR4, RT-Duroid 5880, teflonn etc. mostly used the FR4 substrate because of this PCB (printed circuit board) are low cost and easy available in the market. The basic structure of microstrip patch antenna as shown in figure 1.

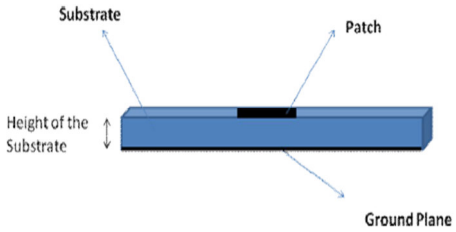

Figure1. Basic structure of microstrip patch antenna

The advantages include planar surface,possible integration with circuit elements, small surface, generate with printed circuittechnology and can be designed for dual and multiband frequencies [5].

Disadvantages include narrow bandwidth, low RF power handling capability, largerohmic losses and low efficiency because of surface waves etc. For the last twodecades, researchers have been struggling to overcome these problems and theysucceeded many times with their novel designs and new findings.

The microstrip antenna as a moisture sensor can be determined the moisture with the help of oven drying technique. It is analyzed that this technique is less time consuming, accuracy and sensitivity.

The coaxial feed technique can be used in the design because of low spurious feed radiation as well as easy fabricate. The co-axial feed technique as shown in figure 2.

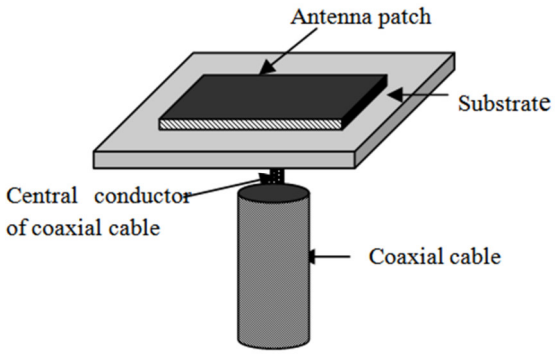

Figure2. Coaxial feed

TECHNIQUES FOR MICROWAVE MEASUREMENTS

Microwaves play an ever increasing role in modern life. The electromagnetic spectrum from 300MHz to 300GHz is called the microwave spectrum. This corresponds to the range of wavelength from 30 cm to 0.3 mm in the free space. Microwaves occupy a region in the EM spectrum that is bounded by radio waves on the side of longer wavelength and infrared waves on the side of shorter wavelengths.

At microwave frequencies, different measurement techniques can be used.

- Impedance bridge technique
- Oven drying technique
- Free space technique
- Cavity resonator technique

a. Impedance bridge technique

Microwave analogs of radio- frequency impedance bridges have been constructed. These microwave bridges have the advantages that null detection is used and uncertainties in the detector response law are unimportant. However, impedance standards at microwave frequencies are difficult to construct. Variable attenuators which serve as standards of resistance, have the undesirable property of shifting the phase along the power level. Thus reference elements of the bridge must be calibrated by another method before one can take advantage of the speed of measurement possible with the bridge methods.

Most bridges are usually of symmetrical structures, to simplify thebalance equations. Much of the simplicity introduced by symmetry is lost inpractice because of fringing fields and associated frequency dependentreactance between the arms of the bridge for comparing transmitted waves. At
the single frequency, the symmetry may be restored by means of appropriatematching devices.

b. Oven Drying technique

The oven drying technique is the standard for the calibration of moisture determination techniques. For the oven drying method, moisture content is determined by measuring the weight of water removed. Oven drying method is inexpensive, high accuracy, limited spatial scale, and response speedy with a less time as well as used very simple equipment requirements. The samples will be take and check the moisture with the help of standard oven drying technique.

The moisture content of a medium may be defined as ratio of the mass of the water in a unit volume of the medium m_w, to the mass of the dry material in the unit volume of the medium m_d, and expressed in percent as follows-

The actual moisture content is determined using standard an oven drying method.

$$\text{Moisture content (\%)} = \frac{\text{Mass of water}}{\text{Dry mass of sample}} * 100 \quad \textbf{(1)}$$

$$\text{Moisture Content (\%)} = \frac{m_w}{m_d} * 100 = \left\{\frac{m_m - m_d}{m_d}\right\} * 100$$

Here, m_m is the total mass of the unit volume of the medium (i.e. $m_m = m_d + m_w$).

c. Free space technique

The methods depending on transmission in waveguide could be readily extended to free space. The process being regarded as an extension, despite the slight simplification of the theory, because of non-standard experimental technique requirements. This extension has advantages as well as disadvantages, not offered by waveguide method.

In all the methods requiring the use of a guide, the preparation of the sample usually takes much more time than the actual process of measurement. But the free space method will eliminate the primary step of preparing the sample before measurements, as most of the industrial materials are normally supplied in sheet form. It results in saving the time for measurements. Besides this increase in speed and simplicity, the experimental procedure has the additional advantage that there are no errors from clearance in cell. Error analogous to clearance i.e. due to diffraction may be eliminated altogether if the sample is sufficiently large. Nelson et. al have been used free space technique for the measurement of complex permittivity of wheat over a very broad frequency range.

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d. Cavity resonance technique

If a section of waveguide is closed at its two ends by metal plates; it iscalled as cavity resonator. A small sample in the resonant cavity will cause ashift of the resonant frequency and change in the quality factor of the cavity.The permittivity of the specimen can be calculated from there changes. Thecavity can be presented either rectangular or cylindrical. To Find VSWR the double minima method is used. The direct method isnot useful to measure the high VSWR because for measuring E_{min}, a greaterprobe penetration is required which produces distortion in VSWR pattern andthe voltage range becomes too broad to permit operation of crystal rectifierentirely in Square law region.
Accurate measurement of VSWR greater than1 can be made using thedouble minima method. The variation of square law detector output, i.e.amplitude square of the standing wave along the slotted section.

CONCLUSION

The analysis of all techniques which is related to determination of moisture content and can be get the accuracy result by using the oven drying technique as well as suitable due to less time consuming, sensitivity as well as get the moisture content in percentage (eq. 1). The calibration and regression equation can be determined and plot the graph between the actual moisture content and predicted moisture content.

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SP-17

STUDY OF STABILISED SOIL BRICKS AND ITS COMPRESSIVE STRENGTH

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ABSTRACT

This paper presents the comparative study of stabilized soil bricks and the influence of stabilizer on compressive strength of soil bricks. For the study, locally available brown colour soil is used for production of bricks of size 230x110x75mm. This paper discusses the results of test performed on soil like atterberg limit test, grain size analysis, hydrometer test, specific gravity test, compaction test. This brownish coloured soil contains less than 10% of clay, therefore 5% clay is mixed before using stabilizer. In this study ordinary Portland cement, Portland pozzolana cement and silica fume are used as stabilizer at 5%, 8% and 10% by weight of soil. The bricks of stabilized soil are manufactured by hydraulic press at constant pressure of 30KN. This soil has (79%) sand fraction and (20.9%) silt & clay. The dry compressive strength of bricks are determined for 7days & 28 days.

KEYWORDS: bricks, compressive strength, stabilizer, compaction, silica fume.

INTRODUCTION

Historically, earth has been the most widely known and used building material in construction and probably has been the most important of all building materials (Legget,1960). Stabilised soil bricks are cost effective and energy efficient alternative materials to the normal burnt clay bricks used for construction of buildings. Actually, most developing countries are facing a real housing deficiency (Harison & Sinha, 1995). Therefore, there is an urgent need to construct and build houses that are more durable at a low cost. A striking contrast between stabilized soil brick and conventional brick is the energy consumed during the production process and carbon emission. In average, cement stabilized soil bricks consumed less than 10% of the input energy as used to manufacture similar fired clay and concrete masonry unit. The technique to enhance natural durability and strength of soil defined as soil stabilization. The demand for sustainable building material at low cost is growing as social, economic and environmental issues evolve in today's society. Recent reports indicated that, about half of the words population are still living in earth building (mc henry, 1984; EBAA, Australia). From the literature the best soil composition for soil-cement is 75% sand, 25% silt & clay, of which more than 10% is clay. This stabilized soil bricks can be used in construction of public buildings like schools, clinics, temples and commercial building, industrial buildings. This bricks can also be used for lining of canals, dams and chimney. It can also be used in military applications such as construction of barricades, fortification, security wall.

What is stabilized soil brick ???

When the natural soil is stabilized through cement or any other stabilizer and then bricks are manufactured in hydraulic press, then it is called as stabilized soil bricks.

What is stabilization ???

Modifying the soil properties by adding another material to improve its durability is known as stabilization of soil. When a natural soil is properly stabilized it will increase the strength of soil, cohesion between soil particles, durability, density. The will become water resistant and the soil will shrink and expand less in dry and wet conditions.

COMPRESSIVE STRENGTH

Compressive strength is the capacity of a material to withstand axially directed pushing forces. When the limit of compressive strength is reached, materials are crushed. it is calculated by dividing the maximum load by the original cross-sectional area of a specimen in a compression test. In general, compressive strength testing procedures for earth bricks follow those developed for fired clay and concrete masonry units. Apply load axially at a uniform rate 14 N/mm² per minute till failure occurs and note maximum load at failure.

MATERIALS AND METHODS

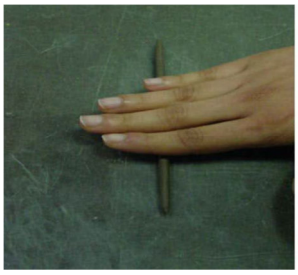
- **CLAY**- Generally, the presence of clay in moderate amount in a soil is desirable. Since clay has cohesive nature, it imparts plasticity to the soil when under moist condition. Thus the clay minerals act as natural binding agents for the cohesionless granular fraction of a soil. The soil which has clay content below 30% can be stabilized using cement.
- **CEMENT**- cement is binding material which having both cohesive and adhesive properties in the presence of water. Optimum cement content for the stabilization is in the range of 5% to 10% where addition above 10% will affect the strength of the bricks in negative way. opc is obtained by adding raw materials like calcareous materials and argillaceous materials. ppc is obtained by adding pozzolanic materials like fly-ash, volcanic ashes, shale, tuffs etc. Waste utilization in ppc makes it more environmental friendly and this cement has more resistance to chemical and sea water attack. It also has low heat evolution.
- **SOIL**- soil is a product of nature. It possesses an inherently variable and complex character. Not every soil is suitable for earth construction. Top soil and organic soil must not be used. The suitability of soil depends on its constituents: sand ,silt and clay proportions.
- **SILICA FUME**- silica fume is an ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production .silica fume is a property enhancing material. In this paper, for study premium- white colour silica fume is used. Because of its extreme fineness and high silica content, silica fume is a very effective pozzolanic material.

TEST PERFORMED

- **ATTERBERG LIMIT TEST-** The atterberg limits are basic measure of the critical water contents of a fine grained soil. depending on the water content of the soil, it may appear in four states: solid, semi-solid, plastic and liquid.

1. **LIQUID LIMIT** is the water content at which the soil has such a small shear strength that it flows to close a groove of standard width.

2. **PLASTIC LIMIT** is the water content at which the soil begins to crumble when rolled into threads of specified size.



3. **SHRINKAGE LIMIT** is the max water content at which a reduction in water content will not cause decrease in the volume of the soil mass.

- **PLASTICITY INDEX** may be calculated as the difference of liquid limit and plastic limit.
- **GRAIN SIZE ANALYSIS**- a quantitative determination of the particle size distribution in a soil is made by sieve analysis and sedimentation analysis.
- **SIEVE ANALYSIS-**the main purpose of this test is to determine particle size of coarse grained soil and fine grained soil.

- **HYDROMETER ANALYSIS**-this method is used for the grain size analysis of the soil passing through 75 micron I.S. sieve out of the fraction passing 4.75mm IS-sieve, to determine the percentage of various sized (silt and clay) particles.
- **SPECIFIC GRAVITY**- specific gravity of soil is the ratio of the weight of a given volume of soil particles in air to the weight of an equal volume of distilled water at a temperature of 4˚c.

- **COMPACTION TEST**- the purpose of laboratory compaction test is to determine the proper amount of water at which the weight of soil grains in a unit volume of the compacted soil mass is maximum. The amount of water, thus calculated is called the "**optimum moisturecontent**"(OMC) and the corresponding density is called "**maximum drydensity**"(MDD).
  Results of test performed on soil sample are given in table1. and the grain size distribution of soil is shown in figure-1.

PROCEDURE FOR MAKING BRICKS

The process for manufacturing of stabilized soil bricks involves the following five steps:

(1) **ANALYSIS OF THE SOIL-** soil composition and analysis through comprehensive test in a laboratory is very important. This will be required to estimate amount of cement and other missing native constituents that must be added to the final mix. All soils are made up of three components: sand, silt, clay.

(2) **SIFTING OF SOIL-** soil should be dried and sieved to remove large lumps, stones, leaves and other impurities) before it can be used properly mixed with cement and compressed into bricks. The soil has the

proper moisture content for sifting when 1. A handful can be squeezed without water appearing on its surface 2. The ball of soil disintegrates without lumps as it is released.

(3) **PREPARATION OF THE MIX-** once soil has been dried and sifted, we can begin to prepare the mix from which bricks will be pressed. The amount of cement to be used will depend on the composition of the soil. More than 10% by volume is not recommended. Mix thoroughly all the ingredients silica fume, cement, soil and special additions such as sand or clay that may be needed. After dry mixing of all the ingredients water is added a little at a time until the damp soil-cement reaches the right consistency. A concrete mixer machine is suitable for preparing the mix.

(4) **COMPACTION OF THE BRICKS-** hydraulically operated machine is used for compacting soil with stabilizer into bricks of desired size. The prepared mix can placed into the mould of the machine and pressure is applied and after compaction, the brick formed is ejected from the mould and stacked.

(5) **CURING OF THE BRICKS-** place the bricks as soon as possible on a flat, non-absorbent surface in a shady environment to cure. Set each brick on edges and space the brick for enough apart so that they do not touch each other. After 24 hours of moulding bricks must be thoroughly sprinkled three times a day with the fine water spray. During the first four days of curing, bricks be covered with plastic.

MIX PROPORTION

To find the strength of the stabilized soil bricks the soil samples have been mixed in various proportions and 48 kg of soil is used for production of 18 bricks, from which 9 bricks are produced for 7 days strength and 9 bricks are produced for 28 days strength determination. The bricks for 7 days and 28 days are produced with same mix proportion. for stabilization of locally available soil used ordinary Portland cement of 53 grade, Portland pozzolana cement and silica fume with different percentage. Table-1 shows the mix proportion with varying percentage of soil, clay, cement and silica fume.

TABLE-1

SOIL	OPC	PPC	CLAY	Silica fume
90%	5%	-	5%	-
87%	8%	-	5%	-
85%	10%	-	5%	-
90%	-	5%	5%	-
87%	-	8%	5%	-
85%	-	10%	5%	-
90%	-	-	5%	5%
87%	-	-	5%	8%
85%	-	-	5%	10%

RESULT AND DISCUSSION

Table -2 shows the result of liquid limit, plastic limit, shrinkage limit- test performed by mixing of silica fume with 5%,8%,10%. Which indicates that after the addition of silica fume with clay and local soil the value of liquid limit is decreased and the value of plastic limit and shrinkage limit is increased. and plasticity index also reduced. Graph-1 shows the liquid limit of locally available soil. Table-3 shows the result of wet sieve analysis which indicates that soil sample consists of 79% of sand fraction and 20.9% of silt and clay. Graph-2 shows the particle size distribution curve obtained by locally available soil. This soil is classified as sandy silt by unified soil classification system (USCS). Graph-3 shows particle size distribution curves obtained by addition silica fume with 5%,8%,10% to the locally available soil. Graph-4 is obtained by compaction test, which indicates the relation between dry density and moisture content. Graph-5 is also obtained by compaction test, which performed on soil with addition of silica fume at 5%, 8% 10% it indicate that as the percentage of silica fume increases, the maximum dry density of soil is decreased and the optimum water content for soil sample is increased.

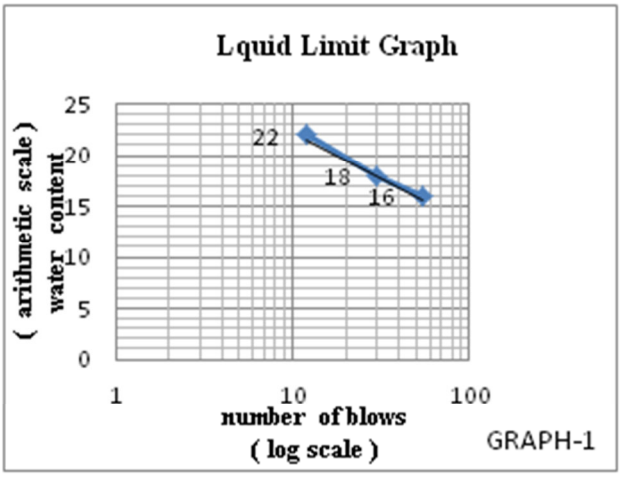
Table-4 shows the result of compressive strength of stabilized soil bricks at 7days with maximum load or different proportions of stabilizers and Graph-6 shows the 7 days strength at 5%, 8%, 10% of stabilizers.Table-5 shows the result of compressive strength of stabilized soil bricks at 28days and Graph-7shows the compressive strength of stabilised soil bricks at 28 days. Graph-8 and graph-9 shows the comparison of strength produced by silica fume and ppc.

TABLE-2

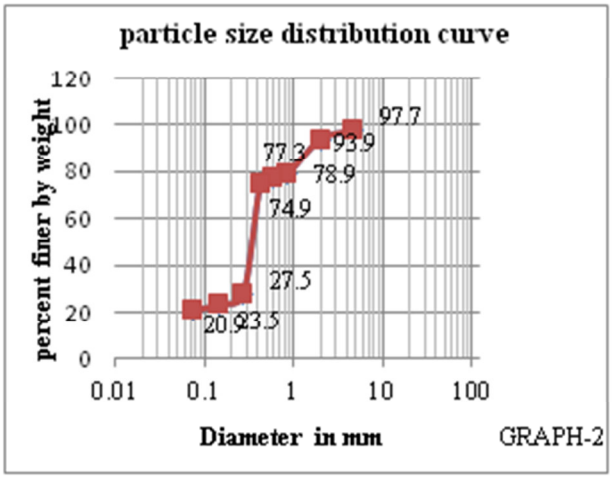
Mix proportion	Soil+5%clay	Soil+5%clay+ 5%SF	Soil+5%clay+8%SF	Soil+5%clay+10%SF
Liquid limit	19	20	19	18
Plastic limit	16	15	16	17
Shrinkage limit	11	11	13	14
Plasticity index	3	5	3	1

TABLE-3

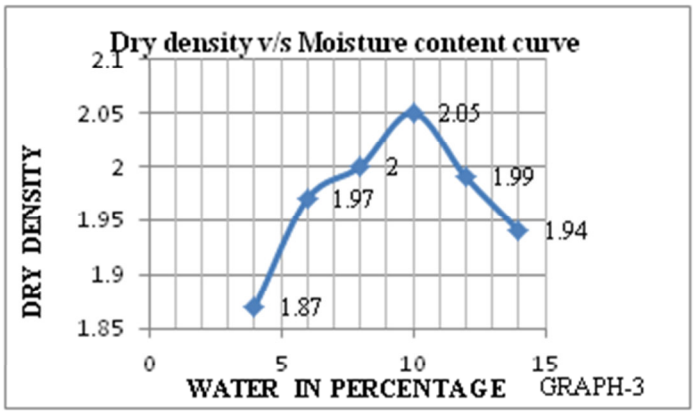
Sieve size mm	Weight of soil retained gm	%weight of retained soil	Cumulative% retained	% finer (100-cumulative)
4.75	11	2.3	2.3	97.7
2.00	19	3.8	6.1	93.9
.850	75	15	21.1	78.9
.600	8	1.6	22.7	77.3
.425	12	2.4	25.1	74.9
.272	237	47.4	72.5	27.5
.150	20	4	76.5	23.5
0.075	13	2.6	79.1	20.9



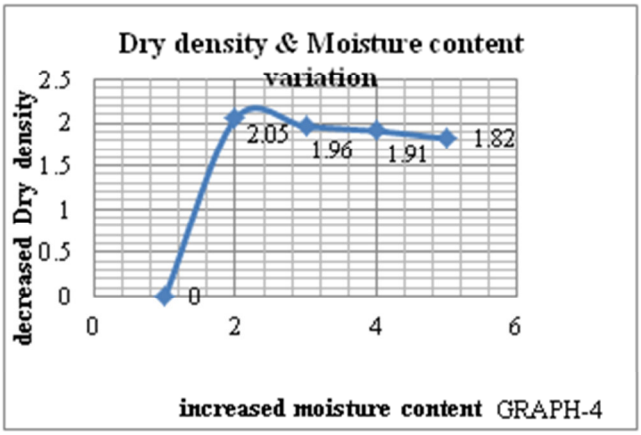
GRAPH-1



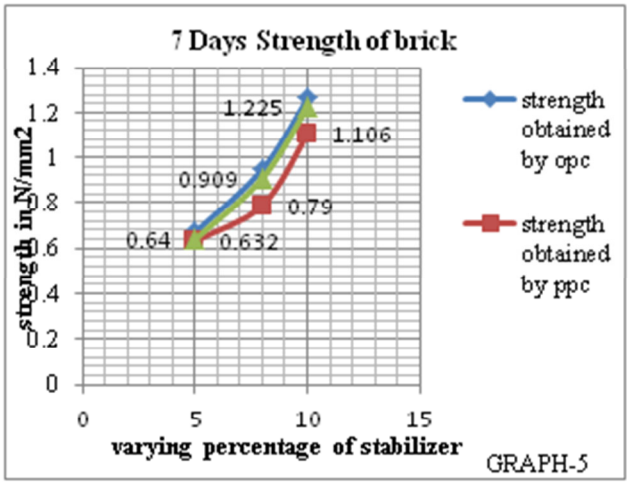
GRAPH-2



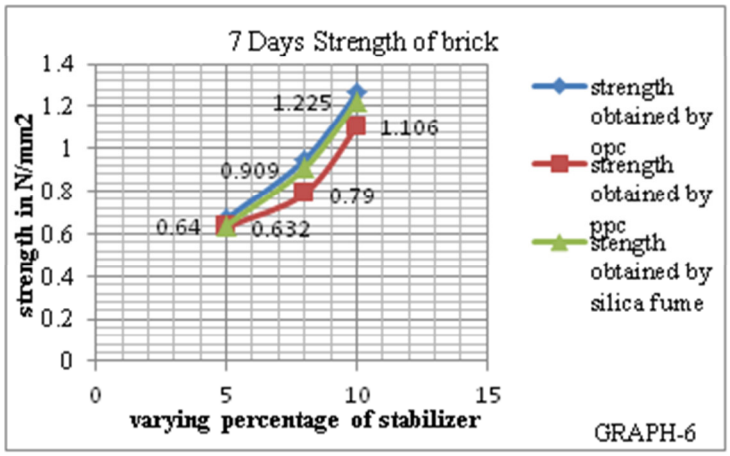
GRAPH-3



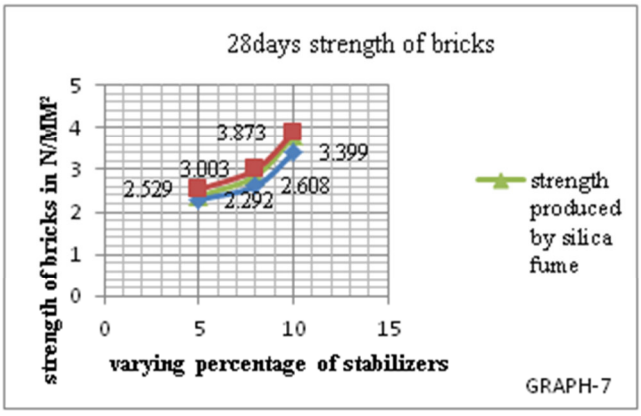
GRAPH-4



GRAPH-5



GRAPH-6



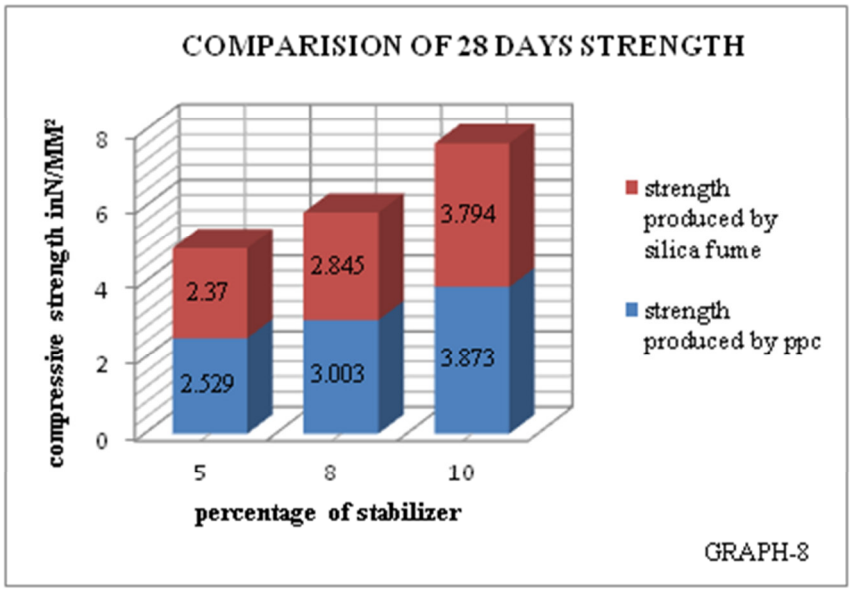
GRAPH-7

TABLE-4

MIX PROPORTION	7 DAYS STRENGTH N/mm²	LOAD(KN)
soil(90%)+clay(5%)+opc (5%)	0.671	17
soil(87%)+clay(5%)+opc (8%)	0.948	24
soil(85%)+clay(5%)+opc(10%)	1.264	32
ppc(5%)+clay(5%)+soil(90%)	0.632	16
ppc(8%)+clay(5%)+soil(87%)	0.790	20
ppc(10%)+clay(5%)+soil(85%)	1.106	28
soil(90%)+clay(5%)+silicafume(5%)	0.640	16.2
soil(87%)+clay(5%)+silicafume(8%)	0.909	23
soil(85%)+clay(5%)+silicafume(10%)	1.225	31

TABLE-5

MIX PROPORTION	28 DAYS STRENGTH N/mm ²	LOAD(KN)
soil(90%)+clay(5%)+opc(5%)	2.292	58
soil(87%)+clay(5%)+opc(8%)	2.608	66
soil(85%)+clay(5%)+opc(10%)	3.399	86
ppc(5%)+clay(5%)+soil(90%)	2.529	64
ppc(8%)+clay(5%)+soil(87%)	3.003	76
ppc(10%)+clay(5%)+soil(85%)	3.873	98
soil(90%)+clay(5%)+silica fume(5%)	2.37	60
soil(87%)+clay(5%)+silica fume(8%)	2.845	72
soil(85%)+clay(5%)+silica fume(10%)	3.794	96



GRAPH-8

- The bricks were un-burnt and hydraulically pressed. The soil stabilized bricks was taken for strength determination after 7 and 28 days.
- The maximum strength of brick obtained was 3.873 N/mm² at 98 KN load, i.e. mixture of [ppc(10%)+clay(5%)+soil(85%)].
- The minimum strength of stabilized soil brick was obtained 0.632 N/mm² at 16 KN load ,i.e. mixture of[ppc(5%)+clay(5%)+soil(90%)].

- Use of ppc as stabilizer in place of opc gives more strength to the bricks with the same proportions of soil and clay and stabilizer.
- Use of clay in soil at constant proportion increases the strength of bricks.
- Use of opc cement at constant proportion of clay does not increase the strength of bricks as produced by ppc cement at 28 days.
- When silica fume is used for stabilization of soil it gives compressive strength less than the strength obtained by ordinary Portland cements and more than the strength obtained by Portland pozzolana cement at 7 days. The maximum strength obtained by silica fume at 7th day is 1.225 N/mm² at 31 KN load when proportions are soil(85%)+clay(5%)+silica fume(10%)
- The maximum strength obtained by silica fume when used as stabilizer at 28 days is 3.794N/mm² at 96 KN. but this strength is less than the strength produced by Portland pozzolana cement.
- The price of one kg of cement is about 6.5 rupees per kg and the price of one kg of silica fume is about 450 rupees per kg. So silica fume is a costly stabilizing material and it is not readly available to use.
- This stabilized soil bricks are moulded by hydraulic press so there is no need to burn it in kiln. Therefore it saves the cost of fuel like cow dung, coal, wood pieces etc. and it saves the time of burning also.
- For manufacturing of stabilized bricks natural material like soil is used in high proportion as compare to the stabilizer. So it reduces the transportation cost of material and overall cost of the material.

CONCLUSION

- The influence of stabilizer on compressive strength of bricks is shown in result. In this paper, a brief review on stabilized soil bricks is done.
- Stabilization of soil brick using Portland pozzolana cement fulfills a number of objectives that are necessary to achieve a lasting structure from locally available soil. Some of those are: better mechanical characteristics (leading to better compressive strength), better cohesion between particles.
- Increase in cement content results in an increase in the compressive strength of bricks moulded at the same constant compaction pressure.
- The result of this paper has revealed that compressed stabilized soil brick can be used as an alternative wall making material.
- The amount of water content for the soil-cement mixture and soil –silica fume mixture needs to be carefully controlled.
- Previous researches showed that stabilized soil bricks demonstrate many advantages compare to conventional fired bricks. This stabilized bricks are environment friendly- no burning of bricks required. It is cost efficient. The utilization of earth in housing construction is one of the oldest and most common methods used by a larger percentage of the developing countries population.

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SP-18

EMOTION RECOGNITION BASED ON HAND GESTURE FOR HUMAN COMPUTER INTERACTION USINGMACHINE LEARNING TECHNIQUES

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ABSTRACT

Psychological researchers have found that body language of a human can provide substantial information in detecting and interpreting emotions. It could express explicit and implicit information mutually of one's emotional state and intentions over multi-channel modalities. These imperative channels include eye gaze, head movement, facial expression, hand gesture and so on. This learning focuses on detecting emotional states from the body language of the hand & head using Computer Vision and Soft Computing Techniques. The proposed ideas for getting human 'expressions based on hand posture are implemented and evaluated by using Open CV and Python. Even with the extensive range of modalities; most scholars have concentrated on facial expression recognition based on hand gesture for detecting human 'emotions. When the emotion is experience, the hypothesis has been established that expression is triggered for a short duration. In current eras, the benefit of multimodal Human Computer Interaction systems has been standard and many researchers are making an effort to integrate various sensing modalities to improve the recital of sentimental behaviour recognition.

KEYWORDS: Facial expressions Recognition, Hand gesture recognition, machine learning techniques.

INTRODUCTION

If the computer acquires the capability to understand and react to users' needs in a friendly, natural, and non-intrusive manner, Human computer interaction (HCI) can be significantly enhanced. Human Computer Intelligent Interaction (HCII) precisely should have the capability to identify subtle variations in the user's behaviour, specifically focusing on the emotional states of the user, and to start interactions established on this data as contrasting to just responding to the user's commands. Humans interact with one another to express emotions and feelings naturally by exploiting multimodal means instantaneously so that one enhances and complements another.

Researchers have tried to investigate these modalities in an effort to categorize and interpret motions for HCII applications. This embryonic field has furthermore attracted increasing responsiveness from researchers of varied fields such as computer science, neuroscience, cognitive science, and related disciplines as shown in figure 1.

Figure 1: Multidisciplinary knowledge of Human 'emotions detection for HCII

Several areas including gaming, e-learning, security, health care, and elder care are covered by Potential applications of emotion detection for HCII. Through verbal as well as nonverbal cues, human emotions can be articulated. Nonverbal information is more vibrant in nature for effective communication. Those must be expressed and inspected as a mandatory facet of emotion. Ekman and Friesen gave a rationale for reviewing nonverbal

behaviour [1-4]. They suggested many reasons for reviewing nonverbal behaviour such as nonverbal expressions sometimes reveal unconscious attitude & behaviour. Human emotions for instant intimacy and anxiety are expressed in nonverbally rather than verbal. Nonverbal supports the feeling of inner sight. verbal behaviours are probably less affected than nonverbal behaviour by the censoring of communication.

Nonverbal cues are crucial in turning interactive information. Moreover, body language could convey emotional state such as depression, enjoyment, boredom, excitement etc. of a person during communication. Verbal communication can also be enhanced through body language such as hand gesture, head movements. For instance, when you eye contact and nod you with some hand gesture, give the clue to the person that you are relating with and realize the subject. The human brain is a multi-signal communicative media with significant tractability and specificity [5].

REVIEW OF LITERATURE

Among human' nonverbal cues are essential in conveying interactive information which can be achieved through body language, while a just some less percentage of communication involved of genuine words [3]. Besides, human communication through body language could convey emotional state of a person such as depression, boredom, enjoyment, etc. based on some posture and gesture of hand and body. Over body language of human, Verbal communication can easily be enhanced. For instance, if you understand the subject then u may present eye contact and nodding, hand gesture cues to the person that you are interacting with. The human brain is a multi-signal communicative media with significant tractability and specificity. When we communicate we can gather essential information such as personal identification, ethnicity, gender, and age, attractiveness. Psychological researchers have found that body language of a human can provide substantial information in detecting and interpreting emotions [5-8].

Emotion is a complex psycho physiological understanding that inspires an individual's behaviour those effects in physical and psychological changes [9]. An internal (physiological) reaction is usually lead by an external (environment) stimulus. Based on research in emotion and psychology, there are some standard phases to recognize human 'expressions. They are pre-processing with normalization, features extractions, features classifications based on requirements. there are mainly focused approached are based for feature extractions & feature classification based on predefined emotional classes.3 major classification approaches.

1. Categorical approach,
2. Dimensional approach, and
3. Appraisal approach

Soft computing & machine learning techniques are ample utilized in the realm of pattern recognition; for instance, in to recognition facial activities, fuzzy classifier was announced. For learning biometric application, fuzzy techniques were in used. With the event of affective computing for feeling recognition, fuzzy logic technique has been used. Linguistic rules and knowledge-based rules given in used to develop a fuzzy logic system. By using computer learning algorithms, the morality has been extracted from the data-driven-based training knowledge set.

Ioannou et al incorporated psychological information regarding feeling recognition to evaluate facial expressions. Assessing the car-racing drivers 'emotions, Katsis et al emphasised on a technique which was based on bio-signals. Lee et al.and Giripunje et al. used fuzzy reasoning system to analyzed feelings from the human speech.

METHODOLOGY

We proposed a geometrical relationship of human organs between nostrils, two pupils, and hand gesture to achieve this task. Four parameters are defined consistent with the changes in angles and also the changes within the proportion of length of the four feature points to differentiate avert gaze from direct gaze. The sum of those parameters is taken into account as an evaluation parameter that may be analyzed to quantify gaze level. "The multimodal fusion "is done by hybridizing the decision level fusion and also the soft computing techniques for classification. This might avoid the disadvantages of the decision level fusion technique, whereas retaining its advantages of adaptation and flexibility [10].

DISCUSSION

Human Computer Interaction includes multi channel information of the head and hand expressions to generate new solutions which should be very natural and inexpensive for detecting emotions of humans. The goal of this study is to analyze new solutions of emotion detection in HCI by integrating multi-channel information of the head

'expressions & hand gesture in a very natural and inexpensive means. This study enriches the present emotion recognition research within the following aspects:

Entirely different emotions occur when a facial expression includes the alternative modalities from the head 'expressions & hand gestures. The implicit emotion isn't perpetually congruent with the explicit face expression. However, this vital factor has been unnoticed by current emotion detection systems. In this study, we are introducing an approach which has two stages. The primary stage analyzes the explicit data from the modalities of facial expression, head movement, hand gesture and eye gaze individually. In the second stage, all this data is amalgamated to infer the implicit secondary emotional states. By integrating the channels head 'expressions & hand gestures, the distinguished emotion could lead to totally different quadrants within the emotional dimension space compared to the corresponding facial expression [11-15].

Head movement not only will give data of the movement direction (head nod or head shake), however also can differ in speed and frequency (high frequency movement or low frequency movement). A very high frequency head movement could show way more arousal and active property than the low frequency head movement that differs on the emotion dimensional space. Though the frequency of head movement incorporates a robust relationship with human emotion, current studies haven't taken this vital cue into consideration. This study examines emotional states of with the help of the head movement frequency as well as the direction of head movement. By the tracking results of the coordinates of the detected nostril points, the head movement frequency is acquired. Here we will study of five classes of head movement. Also we will check frequency of head nodding, head shaking to get the appropriate results [16].

In past analysis, eye gaze was considered in human behavioral recognition (e.g. the detection of human fatigue and attentive states). Psychologists found that gaze direction was associated with approach-oriented and avoidance-oriented emotions. These findings disclosed that gaze direction influenced the process of emotion displays. In this study, eye gaze direction is integrated with different head data to investigate emotional states. A geometrical relationship of human organs between nostrils and two pupils is developed to attain this task. Four parameters are defined per the changes in angles and therefore the changes within the proportion of length of the four feature points to differentiate avert gaze from direct gaze. The total of those parameters is considered as an evaluation parameter which will be analyzed to quantify gaze level [17].

Hand gesture recognition aims to identify the meaning that express the gestures made. With human' hand posture, the communication between human and machine will come closer and no longer need any special medium, but users can simply define a series of appropriate gestures to control surrounding machines. Compared with other input forms of Human-Computer Interaction, hand gesture has better characteristics of natural, simple but with rich expression and direct [1]. Depending on the different ways of hand gesture image acquisition, hand gesture recognition can be divided into sensor includes acceleration hardware based and computer vision based ones. Due to the limitation of complex data gloves and position tracker needed, the hand gesture recognition system based on sensors in expensive and difficult to be popularized, while vision based hand gesture recognition is simple and easy to operate without relying on complex devices or interfaces [2], it has been becoming a challenging interdisciplinary research and hot topic in the field of Human-Computer Interaction.

New solutions are exploited for multimodality fusion by hybridizing the decision level fusion and therefore the soft computing techniques to infer emotions. This might avoid the disadvantages of the decision level fusion technique, whereas retaining its advantages of adaptation and flexibility. However, there's no crisp boundary between high frequency head movement and low frequency head movement or direct gaze and averted gaze. A fuzzification strategy is planned which will successfully quantify with the extracted parameters of each modality where the fuzzified value should be in between 0 and 1. These fuzzified values are the inputs for the fuzzy inference systems that map the fuzzy values into emotional states.

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ANALYSIS OF TRUST PREDICTION FOR ONLINE COMMUNITY NETWORK

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ABSTRACT

In present era of internet amount of users communicate and share information is huge. People used the social network for their day-to-day task such as official work, house hold purchase and shearing data and pictures. Due to this Trust between the users is one of the most important factor for further growth of online social network. Trust connections between clients in different online networks are difficult to demonstrate for computational researchers. To find trust in view of the social Network is often inefficient. To analysis the trust between users in online social network different Data Mining techniques can be used. This paper study the model use for users finding trust in online social network. The paper analysis the different phases used in predicting trust in an efficient way. Paper analysis and demonstrate the model on the open source data collected carefully.

KEYWORDS: Online Social Network, Trust, Trust Prediction

INTRODUCTION

Social Trust Prediction: With the development of Internet, people are increasingly involved in different large, open and dynamic network systems, including social networks and e-service. There are several reasons such as the lack of direct connection from users and privacy concerns, missing trust values in a social trust network are usual. On the other hand, uncertainty exists in online environments, especially those of ecommerce and e-service. The challenges of trust prediction are introduced in many research papers.

With the development of e-commerce and other e-business, social media and online shopping portals, user of these portals are frequently communicate with each other for taking suggestion and shearing their reviews and suggestion on a particular item ,product or users. The trust factor is an essential job in starting these cooperation and building higher-quality connections between the users. For an Example why most of the users or organization gives preference to a particular dealer on e-bay or amazon to purchase an item.it can be that the users or that organization have the previous good experience with that dealer. Then again, one would hesitant to participate in any association with other dealers. On individual sites, trust implies productive understandings between an expert and a business. The administration of these online social network may work to extract and use users trust tendency to assist their users to identify a perfect match. Human mind state about trust are frequently different for person to person. For one user may trust to a particular dealer on amazon gives an extraordinary rating, even though the fact that this dealer have delay in transport by seven days occasionally? For someone else any deferral may be unsatisfactory. Trust aware frameworks can enable users to remain on the correct decisions and have connections that prompt positive results. Despite the fact that trust takes a wide range of implications and very upon the setting in which users associate with one another. It tends to be demonstrated that trust can be approximated from different connections.

TRUST PREDICTION MODEL

Trust that categorically the direct and indirect, frequent communication between users is essential for delivering high trust. This knowledge allows one to accurately estimate the social trust with a collection of quantitative trust factors. This work is an investigation of construction of trust prediction model in online

Social networks an analysis an approach to trust prediction that enables one to tell which factor are more critical for trust prediction. This study also analysis different factor that can be commonly part into two classes: user similarity and association between truster and trustee. One can utilize these factor to increase the trust in trust prediction in past research methods. Demonstration of the factors for positively link prediction proposed by Liu .several trust propagation techniques is reviewed by Urena et al. for finding the trust value and their opinion dynamic analysis for social network.

CLASSIFICATION OF TRUST

There are many trust Calculation methods proposed to determine assessment of trust i.e. it quantifies how much a specific user can be trusted by different user for the online social network. Different philosophies being utilized for estimation are as per the following.

Global and local trust measurements: From personalization perceptive, worldwide trust metric anticipate a similarity trust matrix of a given user for all users, The Matrix does not rely upon whose participating in trust. Personal or local trust calculation give an adapted trust value that relies upon the purpose of assessing user.

Supervised vs. Unsupervised trust measurements: From procedure viewpoint managed trust measurements consider trust prediction as a group. Trust value is anticipated based on user traits and user cooperation via preparing a SVM or NB classifier while unsupervised techniques are normally founded on availability of users in trust systems and utilize trust propagation properties to predict trust.

CONTEXT INSENSITIVE TRUST PREDICTION

Numerous online social network permit users to give a trust and rating to their companions, or to choose a word from a list to show the trust rating among them and their companions. The missing trust value can be predicted from trust calculation in the types of numbers or words. The conventional ways to deal with predict trust are to assess trust from a source user to a target user Path between them that comprises of connections and trust value. This kind of methodologies is named as propagation based trust prediction. Trust propagating has been examined in many web application portals, including e-business, P2P frameworks, and social communities. Then again, a user be likely to pass on in other similar users. The trust value can be predicted from the conduct of providing estimation in the trust matrix utilizing single context models, for example, Matrix factorization. Vs. multiple context based trust prediction models are to calculate the trust between two users from their similar trust factor and so on disclosed in the trust assessment .Several researchers predict trust either by means of trust propagation, considering propagation trust and tendency, or simply using the similarity of rating values. Initially, all the trust tendency, produced trust and friendship impact the trust between two users. Every one of them must be used to predict link wise trust, instead of thinking about just a single or two users. Second, the similarity of trust rating assumption describe the closeness of user's practices in giving trust calculation. Therefore, it is important for trust prediction. Third, every one of these various kinds of factors, addressing to either close to inter properties or intra properties. In this manner, they must be handled independently and collectively convey high precision in trust prediction. Rajeev et al. also proposed a trust prediction method by utilizing ant and swarm colony optimization.

CONTEXT-SENSITIVE TRUST PREDICTION

Other than trust value or assessment, online social networks have a measure of setting data, which can be find by data mining methods. Trust is context dependent and it is rare for a user to have full trust on other user for each context. For instance for most of the online social networks full trust is under 1% for each aspect such as epinions and ciao. Both of these are predominant product survey site worldwide. In the real word trust on each other is dependent on specific area. As an example a user A trust to user B in playing cricket. But may not trust on teaching Java. It doesn't mean that user A cannot trust user B for baseball. So the relevant data must be used to additionally enhance trust prediction. Several studies have recommended

to anticipate trust considering some sort of social significant data. Liu et al propose a randomized calculation for looking through a sub network from a source member to a target user, which considers significant data for trust assessment. A prediction method is proposed in to look through the local social trust model fulfilling expert social network organizations with lay down requirements. Wang et al. propose a probabilistic social trust model to derive trust from an online social network exploring all available social site data. Mama et al. consider social factor to determine the preference of friendship between companions. Zhong et al. propose the KPMCF model to learn social relationship quality by breaking down profile data including factors, bunches and so forth. Social labels have restricted limit in reflecting individual data, including particular friendship, region competence, and the relationship and similarity with others. Frikha et al. proposed Time based trust prediction model is also a context based trust model which finds the trust between friends and user in social networks.Social site must contain any data that reflect a person's social attributes, and the social association with other individuals inside an online social network. Most trust prediction models experience the disadvantages:

(I) the property of trust value has not been considered adequately. For instance, the difference of individuals' trust can be displayed from the trust value, as well as from their distribution;

(ii) The various variety of social factors isn't well managed. The association between two individuals can be community, relative, business organization, or colleague and so on. Indeed, even with a similar sort of relationship-say link, their communication frequency and association settings can be unique;

(iii) The approaches to join social data require more consideration, as inappropriate presentation of social data may present lass précises and corrupt the trust prediction quality;

DYNAMIC TRUST PREDICTION

Trust may change over the time particularly in an online social network. In online social network, mostly in internet business and e-commerce situations, the framework keeps up the past cooperation data for a specific period which offers the probability to predict a user potential trust. There are numerous elements that influence a user trust. For example, in online shopping sites, amazon and flipkart the trust to a dealer can be multiple from other, i.e., ambiguous. It might fluctuate by mistake or deliberately as indicated by various things such as diverse purchasers and so forth. It will probably exchange carelessly toward the evening just before the end time or in peak time. Thus, the trust of a member effectively or frequently changes. Several study proposed various methodologies to show dynamic trust of members in web based business and e-benefit conditions. The Beta model is an early static model in which the reliability of any expert network is predict to be expressed by an established probability dispersion over results. The Beta model with a context insensitive factor are inefficient and costly, although this methodology demonstrates execution in specific situations, it isn't productive in different situations where the supplier's behavior is very high. In some study the Hidden Markov Model (HMM) approaches in demonstrating batter results, just concentrating on the results of each past exchange. Be that as it may, these methodologies disregard the logical data about every switch. Liu propose a Markov model dependent on relevant data, which separates features from replace logical data as the HMM opinion train, and regards the results directly as the state of the models. However, it exposes the hidden states and the researcher additionally expect a progression of switch over between a merchant and a same client, which can hardly be used in most real situations.

CONCLUSION

This paper study the previous work for trust measurements and analysis a general trust calculation model on the basis of client movement for a huge online social network like amazon or twitter. Most interpersonal organization does not have consistent clear trust evaluations, it is possible that they have twofold or no trust connections. In such a situation demonstration of trust connections can be utilized for the features of direct trust. This work is a preliminary study towards the production of more robust trust prediction model which can be utilized by social recommender system. As a future work a novel method can be developed. In step first network is divided in smaller sub network. Then predict the trust with some propagation method such

as matrix factorization and uses the trust measurement feature more precisely for both context sensitive and insensitive trust.

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SP-20

A REVIEW ON METHODOLOGY OF TEXT MINING

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ABSTRACT

Data Mining is the process to extract hidden predictive information from database and transform it into understandable structure for future use. The assorted domains in data mining are Web Mining, Text Mining, Sequence Mining, Graph Mining, Temporal Data Mining, Spatial Data Mining (SDM), Distributed Data Mining (DDM) and Multimedia Mining. Data mining is used for financial data analysis, retail and telecommunication industries, science and engineering and intrusion detection and prevention. Text mining is used to extract interesting information or knowledge or pattern from the unstructured texts that are from different sources. It converts the words and phrases in unstructured information into numerical values which may be linked with structured information in database and analyzed with ancient data mining techniques. This paper is focused on analysis of many techniques used in text mining such as information extraction, information retrieval, natural language processing (NLP), query processing, and categorization and clustering.

Keywords: Data Mining, Text Mining, Natural Language Processing, Techniques, Issues, Challenges

INTRODUCTION

Content Mining is likewise called as content information mining, which is utilized to discover intriguing data from extensive database. The information mining devices can be intended to deal with organized information from database. Be that as it may, the content mining can be work with unstructured information or semi-organized information. Content Mining is to break down extensive amounts of characteristic dialect content and it distinguishes lexical examples to extricate valuable data. Content Mining is helpful for association on the grounds that the vast majority of the data is in content configuration.

The additional advances can be incorporated into content mining are as follows:
1. It changes over the unstructured content into organized information
2. Identify the examples from organized information
3. Analyze the examples utilizing Text Mining strategies
4. Extract the helpful data from the content

PROCESS OF TEXT MINING

Following are the process of text mining:

1. Archive Gathering

In the first place step, the reports are gathered that are available in various organizations. The archive could be in type of word, html, css, pdf and so on.

2. Record Pre Processing

In this procedure, the given report is handled for disposing of redundancies, irregularities, isolate words, stemming and records are prepared for subsequent stage, and the stages executed as takes after:

(a) Tokenization: The given record is perceiving as a string and recognizing single word in archive i.e. the given archive string is circulated into one unit or token.

(b) Removal of Stop word: In this stage the expulsion of normal words like an, an, and, of, yet and so forthas been finished.

(c) Stemming: Stem might be a characteristic gathering of words with fundamentally the same as significance. This strategy characterizes the base of the specific word. There are two sorts of stemming technique i.e. Inflectional and Derivational.

3. Content Transformations

Content archive contains an accumulation of words and their events. There are two routes for portrayal of such reports is Bag of words and Vector space show.

4. Quality Selections

This strategy prompts giving less database space, negligible pursuit system by expelling superfluous element from input report. There are two strategies in trait determination, Filtering and Wrapping techniques.

5. Example Selections

In this stage the standard information mines process joins with the content mining process. Organized database utilize the great information mining strategies that came about because of the past stage.

6. Understanding/Evaluation

This stage measures the outcome, the outcome can be secured or it will be utilized for next arrangement of succession.

METHODOLOGIES IN TEXT MINING

The methods in content mining from various regions, for example, data extraction, data recovery, characteristic dialect handling (NLP), order and grouping. Every one of these phases of content mining procedure can be joined into a solitary work process**.**

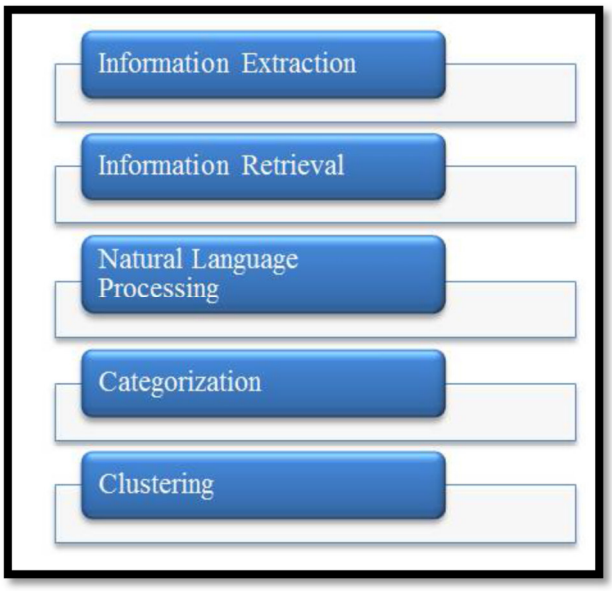

Fig 1 : ***Techniques in Text Mining***

Following steps are involved:

1. Information Extraction

Data Extraction is the way toward extricating data from unstructured archive utilizing the systems. The principle target of data extraction is to discover particular information or data in normal dialect content. The exact process of data extraction is as follows:

Term Analysis: It distinguishes the term; the term may contain at least one words.

It can be useful for separating data from archives.

Named Entity Recognition: It distinguishes the literary data in an archive relating the names of individual, put, association or item.

Fact Extraction: It distinguishes and removes the mind boggling actualities from the reports.

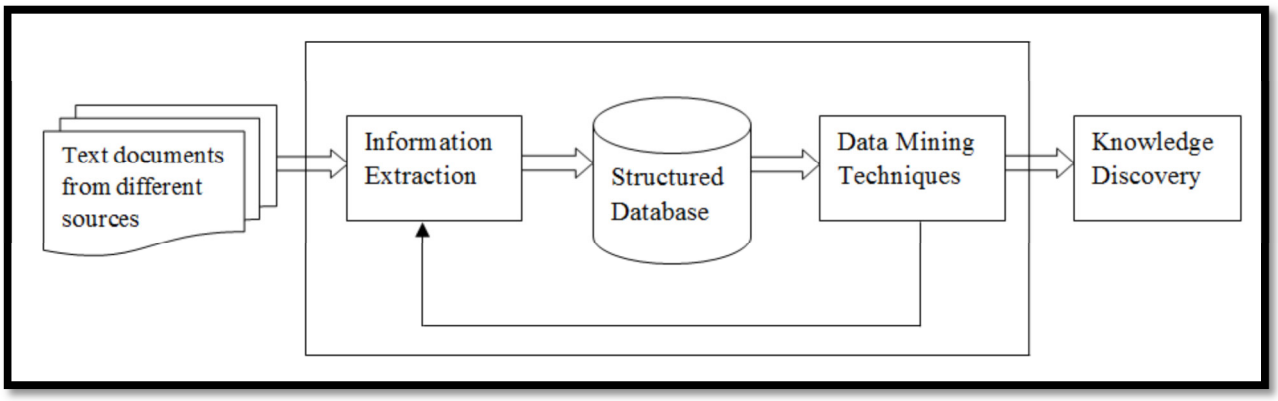

Fig 2 : *Information Extraction*

2. Information Retrieval

It is utilized to distinguish the applicable archives in a record accumulation which is coordinating a client's inquiry. The most essential utilization of data recovery framework is internet searcher like Google, which recognize those reports on the World Wide Web that are significant to client inquiries or an arrangement of given words. It additionally alludes to the programmed recovery of reports from archive gathering. It manages creeping, ordering reports and recovering archives. Data recovery framework utilized as a part of computerized libraries, online archive frameworks and web search tool. Data recovery manages whole scope of data preparing from information recovery to learning recovery.

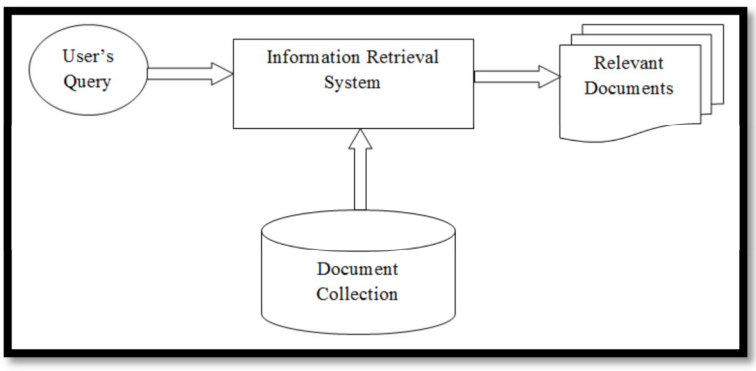

Fig 3: *Information Retrieval*

3. Natural Language Processing (NLP)

It is worried about associations amongst PC and human (characteristic) dialects. NLP is identified with the region of human-PC connection. NLP is the segment of an Artificial Intelligence (AI). It is utilized to break down the human dialects with the goal that PCs can comprehend characteristic dialects as people do. The ways to deal with NLP depends on machine taking in; a sort of computerized reasoning that looks at and utilizes the examples in information to enhance a program's own comprehension. The part of NLP in Text Mining is to give the frameworks in the data extraction stage with etymological information that they have to play out their errand. NLP incorporates the following:

Part of Speech labeling: It is utilized to group the words into classes, for example, thing, verb or descriptor.

Chunking: It is likewise called as shallow parsing, used to distinguish just the primary syntactic components in a sentence, for example, thing expressions and verb phrases.

Semantic Role Labeling: It is utilized to discovery of semantic contentions related with predicate or verb of a sentence.

Language Model: It appoints a likelihood of grouping of words by methods for likelihood dissemination. It gives setting to recognize words and expressions that sound comparable.

Semantically Related Words: This is the errand of foreseeing whether two words are semantically related which is measured utilizing the WordNet database.

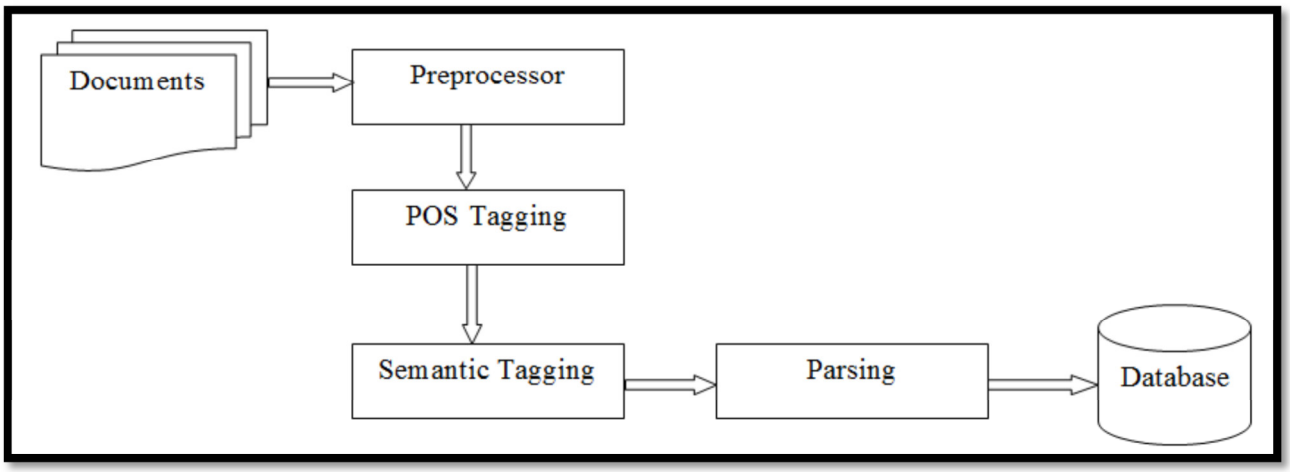

Fig 4: ***Natural Language Processing***

4. Categorization

The procedure of arrangement is, perceiving, separating and understanding the thoughts and items to assemble them into classes. A class clears up the connection between the subjects and protests of data or information. Arrangement is pivotal in dialect, forecast, basic leadership and in a wide range of natural cooperation. It includes recognizing the critical subjects of an archive by putting the report into a predefined set of topics. Once the record is sorted, a PC program can commonly regard the record as a "sack of words". It doesn't endeavor to process the real data as data extraction does. Generally, arrangement processes just include the words that show up the report, and from the tallies, it recognizes the critical points that the archive covers. The primary objective of classification is to order an accumulation of records into a settled number of predefined classifications. Each archive may have a place with more than one class.

5. Clustering

It is a procedure of parceling an arrangement of information or articles into an arrangement of significant sub-classes, is called groups. This method is utilized to amass the comparative archives. The advantage of

grouping is that reports will appear in numerous subtopics, so guaranteeing that a valuable archive won't be discarded from query items. A fundamental grouping calculation makes a vector of subject for every single record and measures the weights of how well the report fits into each bunch. Grouping innovation can be useful in the association of administration data frameworks, which can contain a large number of archives. There are many bunching techniques accessible and each of them may give an alternate gathering of a dataset. Grouping techniques can be arranged into two classifications:

1. Hierarchical Methods

Various leveled bunching develops a group chain of command or, as such, a tree type of bunches likewise called as Dendogram. Each bunch hub contains tyke groups; connection bunches apportioned the focuses secured by their common parent. Such partner approach licenses investigating information on totally unique levels of granularity. These strategies are partitioned into Agglomerative (Bottom-UP) and Divisive (Top-Down) techniques. An Agglomerative grouping begins with one point bunches and recursively blends at least two with most suitable bunches. A Divisive bunching begins with one group of the considerable number of information focuses and recursively parts the most proper groups. This procedure proceeds until the point that the asked for number of bunches is accomplished.

2. Non-Hierarchical Methods

The non-various leveled techniques separate a dataset of N objects into M groups, with or without cover. These techniques are isolated into parceling strategies, in which the classes are totally unrelated and furthermore the less normal stamping techniques. Each protest might be an individual from the bunch with generally comparative.

APPLICATIONS OF TEXT MINING

Content Mining has high business esteem. It is a creating innovation for dissecting huge measure of unstructured archives with the end goal of removing fascinating example or information. There are a few area particular uses of Text Mining, various applications had clarified here:

1. Security Application

Numerous content digging bundles are showcased for security applications, especially perception and examination of online plain content sources like web news, web journals, and so on for national security capacities. It additionally worried about the investigation of content encryption and decoding.

2. Biomedical Application

Content Mining is utilized as a part of restorative forte for ID and arrangement of specialized terms inside the area of natural science comparing to the ideas.

3. Company Resource Planning

Mining Company's reports and correspondences for exercises, in this way its asset status and issues will be taken care of legitimately and future activity arranged can be plan.

4. Market Analysis

With the assistance of various content mining procedures, showcase investigation is worried to break down the contenders inside the market and can likewise be utilized to screen client sentiments and singing for new potential clients.

5. Customer Relationship Management

It essentially manages dealing with the client messages. CRM comprises of giving material support of the client according to their demand and giving quick solutions to their inquiries.

ISSUES IN TEXT MINING

The primary testing issue in content mining emerges from the intricacy of a characteristic dialect itself. The regular dialect isn't free from vagueness issue. Vagueness implies the capacity of being comprehended in at least one conceivable ways. In a content archive single word can have more than one implications and one expression or sentence can be translated from multiple points of view which coordinated to various implications of articulation. Following issues text mining is facing:

1. Intermediate Form

Middle of the road frames with variable degrees of multifaceted nature are proper for various mining purposes. For an area particular learning disclosure undertaking, it is basic to perform semantics examination to determine an adequately rich portrayal to catch the connection between the articles or ideas characterized in the archives. In any case, this examination technique is computationally costly and regularly works in the request of a couple of words for each second. It remains a test to imagine how investigation can be made more effective and versatile for vast sum content.

2. Multilingual Text Refining

Despite the fact that information mining is essentially dialect autonomous, content mining contains a huge dialect part. It is vital to create content refining calculations that procedure multilingual content records and it deliver dialect free halfway structures. Despite the fact that most content mining apparatuses accentuation on handling english records, mining from reports in different dialects grants access to already unused data and offers another host of shots.

3. Domain Knowledge Integration

Space learning, not accommodated by any present content mining apparatuses, can assume an imperative part in content mining.

CONCLUSION

Information Mining is the imperative and dynamic research region which separates accommodating examples from the information. These examples produced encourage basic leadership in businesses. Content mining is likewise critical field that provides arrangements with unstructured or semi organized information. In this paper we have depicted the different content mining strategies, for example, Information Extraction, Information recovery, Natural Language preparing, Categorization and Clustering. And furthermore we have characterized content mining handling stream, utilizations of content mining and issues in content mining. Mining content in various dialects might be a noteworthy issue, since content mining devices and methods should have the capacity to work with a few dialects and multilingual dialects. Incorporating a space learning base with content mining motor would expand its effectiveness, particularly inside the data recovery and data extraction stage.

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