ADARSH MAHILA MAHAVIDYALAYA, BHIWANI

Affiliated to CBLU, Bhiwani

3.2.1 : Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge
(patents filed, published, incubation center facilities in the HEI to be considered)

Ecosystem for Innovation

INDEX

Research Forum

Research forum, an initiative of our college was started in 2020 with the aim of inculcating research aptitude among the students. It encourages research interest among students and teachers as well. The ultimate goal of the research forum has been to promote research related activities for the benefit of the educational institute at large.

Vision- To build an endeavour to cultivate high-quality educational experiences with students' personal, academic, and professional growth.

Mission: To provide an integrated value through quality training, empowerment, research.

Objectives-

1. To bring in research ambiance for the students.
2. To create an awareness regarding the research work carried out / Guided by Faculties.
3. To motivate the students to undertake innovative research projects.
4. To enlighten the Faculties and students through special lectures on contemporary research topics by renowned experts in key areas.

Under the guidance of IQAC, research forum directed different departments of the college to conduct different research projects and surveys regarding environmental quality of our college.The aim of these activities is to give the research insights to the students.

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Events and activities focused during the session 2020-2021-

Name of the Activity	Organising agency	Year
Survey on Environmental Quality	Department of Botany	2020-2021
Survey on Noise Pollution	Department of Physics	2020-2021
Health Survey on COVID-19	Health Club in Collaboration with Red Ribbon Club	2020-2021
Survey on Cowsheds in Bhiwani	Department of Zoology	2020-2021
Vehicle Survey	IQAC	2020-2021

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1. **Survey on Environmental Quality**- Department of Botany conducted a survey on environmental quality of the campus of Adarsh Mahila Mahavidhyalaya. It's objectives are:

✧ To study the solid waste management.
✧ To study about the vermicomposting.
✧ To provide knowledge about air quality monitoring.
✧ Water conservation
✧ To study about e-waste
✧ Energy Conservation

Questionnaire was filled by the students about air quality to check how much they are aware about air quality.

2. **Survey on Noise Pollution** - Department of Physics conducted a survey on sound pollution in the campus of AMM to create awareness regarding the sound pollution and to investigate the noise level in the campus. for this purpose they use HTC sound level meter.

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Noise pollution levels on less crowded days are lower than on crowded days. Due to high traffic, surrounding areas and commercial sites, we found that the level of noise pollution is very high. Since the library is considered to be the most peaceful area of any college and as per the observation here, the noise pollution is less and creates a peaceful environment for the students.

3. **Health Survey on COVID-19**- A health survey was done in our college campus by the health club in collaboration with the red ribbon club to check the mental and physical health of the students during this pandemic. The objective of this survey is to create awareness among the students about the importance of good health.

4. **Survey on Cowsheds in Bhiwani**- In our neighbourhood andcity, we see many stray animals which do not have any shelter.They are always found on roads which is not safe for humans aw well as for themselves. Cows and bulls are also one of them.

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So to know their real situation in Bhiwani city, we found that we should aware the students about them and their lives so that we can protect those animals.

To attain this purpose, the department of zoology,Adarsh Mahila Mahavidyalaya, Bhiwani organized a survey of cowsheds in Bhiwani under the able guidance of Dr.Rajni Raghav Principal AMM Bhiwani.The survey will not be conducted in the session 2020-21 due to covid-19 as the students were not available so,the survey will be continue in session2021-22.

In this session2020-21, the data of cowsheds in Bhiwani was collected such as no.of cowsheds, no.of cows and bulls , type of funds of cowsheds and distribution of milk etc. Students were motivated to gain knowledge about cows, their breeds and their characteristics. Online classes were taken to aware the students for animal protection.

Our main aim of this survey is also to know about the situation of cows in cow sheds as if they are getting sufficient food, healthcare, hygienic place and proper nourishment. For al these details a questionnaire will be prepared and al the data about cows and cowsheds will be collected.

Based on all discussion, we concluded that there is very much need of awareness of students and society towards animal protection

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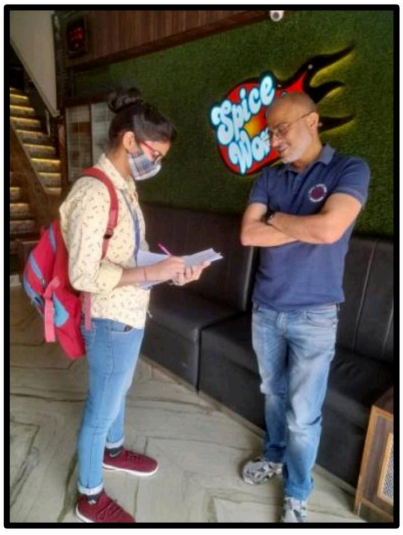
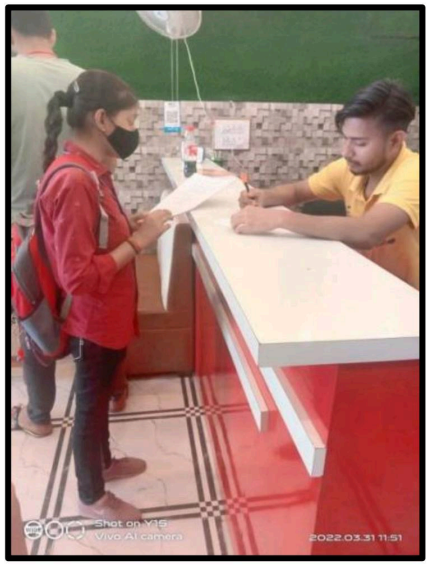
Events and activities focused during the session 2021-2022-

Name of the Activity	Organising agency	Year
Survey to know Impact of Covid-19 on Local Market	Economics Department	2021-2022
Survey of Cowsheds	Zoology Department	2021-2022
Workshop on "Using SPSS for Social Science Research"	Research Forum	2021-2022
One Day Workshop on " Research Informatics"	Research Forum	2021-2022

1. **Impact of Covid-19 on Local Market**- A Survey was done by the department of economics to analysis the impact of Covid 19 on the local market of Bhiwani.For this purpose we have selected five markets(grain, electricity, cloth, pharmaceuticals, hospitality).The objective of the survey is to study the impact of covid 19 on local market and to make students familiar with research and to make students know about different methods of collecting sample.





2. **Survey of Cowsheds**- A Survey of Cowsheds was conducted by the department of zoology. The objective of the survey was identifying and prioritizing the constraints faced by cowsheds in Bhiwani. Students visited four cowsheds of Bhiwani named as Shri Gaushala Trust, Nandishala, Shri Gopal Gauras Gaushala and Dwarkadish Gaushala.

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3. Workshop on Usage of SPSS in Social Sciences Research

A training workshop on the usage of Statistical Package for Social Sciences (SPSS) software was organised on 26th May 2022 by the Research Forum, AMMB under the able guidance of Mrs Rachna Arora, Principal, AMMB and Dr Manjeet Maan, Coordinator, Research Forum. Ms Neerja Parmar and Ms Riya were the conveners of the workshop. The speaker was Dr. Anjali Malik, department of Psychology, M.D. University, Rohtak. The objective of the workshop was to provide training on the use of SPSS for data analysis. The direct beneficiaries of this workshop were students of P.G. and Commerce department along with the faculty members. The workshop received an overwhelming response in terms of students and faculty participation.

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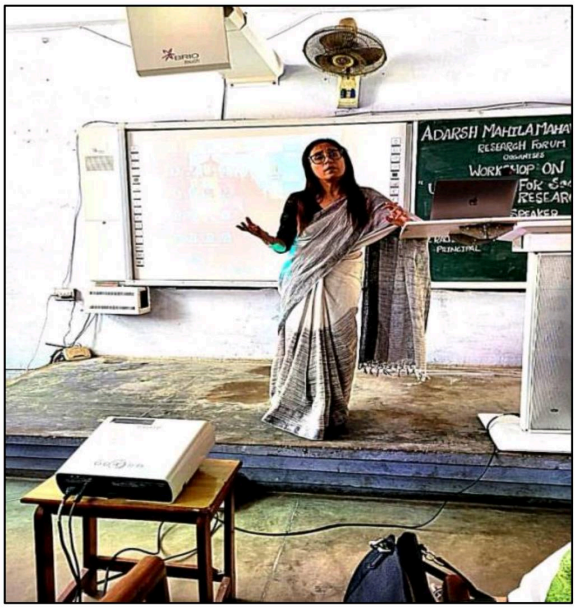
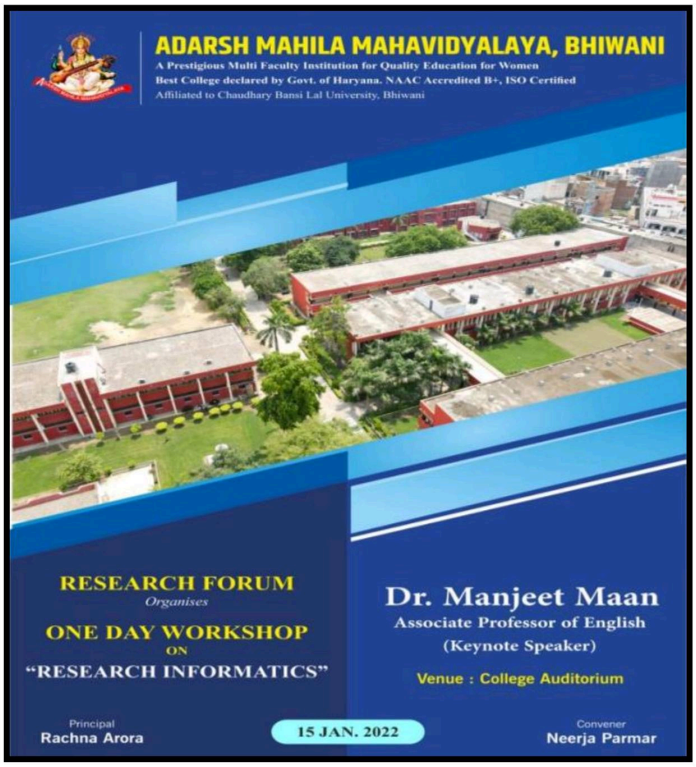


4. <u>One Day Workshop on Research Informatics:</u>

Research Forum has organized a One Day Workshop on "Research Informatics" on 15th January 2022. The workshop was under the guidance of Madam Principal Ms. Rachna Arora. The keynote speaker of the college was Dr. Manjeet Maan, Associate Professor, English. The workshop aimed to provide knowledge about the informatics and uses. Dr. Manjeet Maan explained all the basic points regarding Research Informatics and its uses. She also told how we can take advantage of Informatics in our research work. She cleared all the doubts of the students and faculty members regarding this topic. 40 teachers and 90 students attended this workshop.



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Entrepreneur Cell

The main objective of Entrepreneur Cell is to encourage and inculcate entrepreneurial skills among students apart from their regular course/knowledge and skill. With an intent to make students understand what exactly entrepreneurship is all about and what it requires to become an entrepreneur, how does an enterprise works, what all is required before a business can be taken up, all such questions are answered through Entrepreneur Cell events.

Vision:

To produce successful entrepreneurs imbibed with innovative skills and ethical business practices contributing to the development of the society and growth of the nation.

Mission:

Inculcate entrepreneurial skills and make students see every problem as an opportunity.

Objectives:

- To create awareness on Entrepreneurship among the students through training programmes and camps.
- To enhance Industry Institute Interaction through guest lectures and Industrial Visits.
- To help students acquire necessary managerial skills to run an enterprise effectively.
- To help students channelize their goals to become a versatile entrepreneur.

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Events and Activity done in session 2020-2021:

Name of the event	Organizing Agency	Year
One Day National Seminar on "Entrepreneurship and India: Strategies for transformation and growth	Entrepreneur Cell	2020-2021

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One Day National Seminar on "Entrepreneurship and India: Strategies for transformation and growth-

Entrepreneurship Cell has organized a One Day National Seminar on "Entrepreneurship and India: Strategies for Transformation and Growth" on 1 st February, 2021 under the guidance of Dr. Rajni Raghav, Principal, AMMB. Ms. Gayatri Arya, Assistant Professor of Commerce was the keynote speaker. She explained the opportunities for entrepreneurship in India. She talked about how one can be an entrepreneur with the limited resources. She also explained the strategies for transformation and growth. She also solved the doubts of faculty members and students related to entrepreneurship. 25 teachers and 80 students attended this seminar.

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Events and Activity done in session 2021-2022:

Name of the event	Organizing Agency	Year
One Day Seminar on "Entrepreneurship Ecosystem"	Entrepreneur Cell	2021-2022
Two Days Workshop on Entrepreneurer Skills	Entrepreneur Cell	2021-2022

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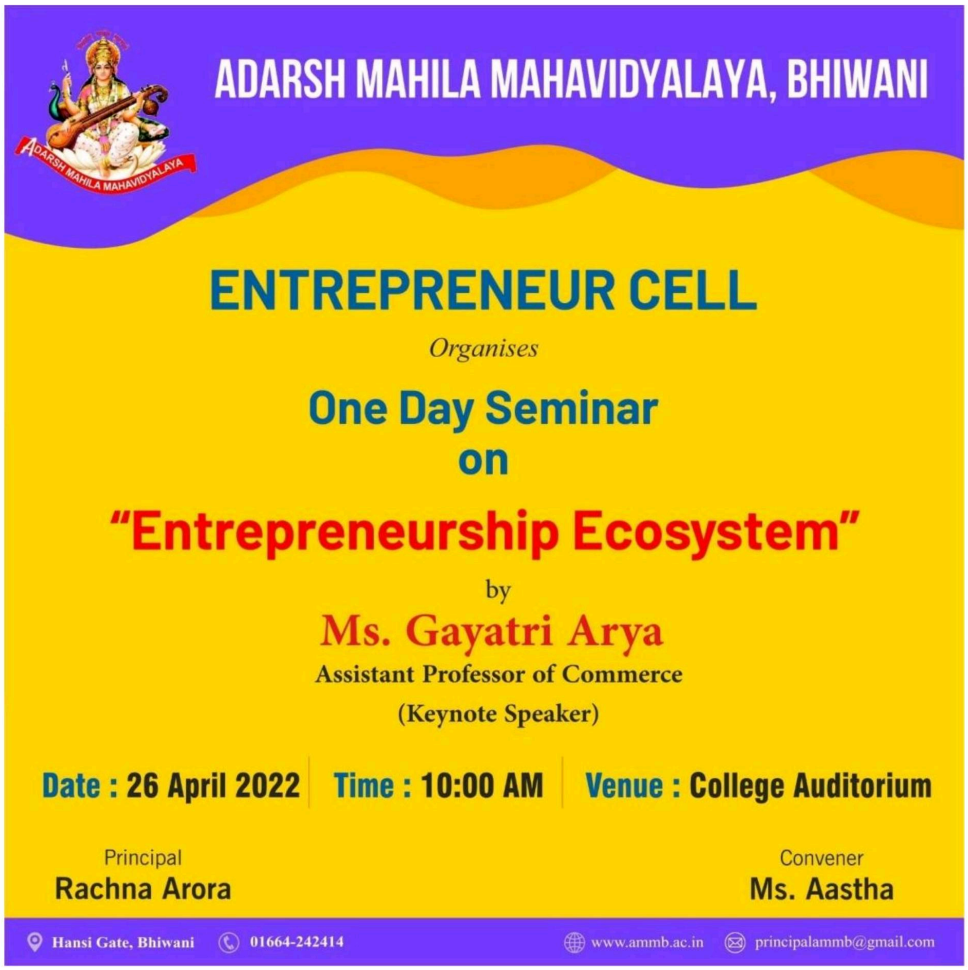
One Day Seminar on "Entrepreneurship Ecosystem":

Entrepreneur Cell organized a One Day Workshop on Entrepreneurship Ecosystem on 26th April, 2022 under the guidance of Ms. Rachna Arora, Principal AMMB. MsGayatri Arya was the Keynote Speaker of this worshop. She talked about the basic meaning of Entrepreneurship. She explained how one can be an entrepreneur, how one can set up his/her own business. She also cleared the doubts of students and faculty members regarding Entrepreneurship and gave ideas for setting up of new businesses. 30 teachers and 60 students attended this workshop.



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Two Days Workshop on Entrepreneurer Skills

The Entrepreneur Cell organized a two-day workshop on Entrepreneur Skills On May 06, 2022. On the first day of this workshop, Mrs. Funnisha Singla presented her lecture on Entrepreneurial Skills. Explaining the definition of an entrepreneur, she explained its types and utility.In this workshop, students participated enthusiastically and many students also expressed their views. MA Economics student told about her share trading experience in stock exchange and Somi gave information about Forever company. This workshop was organized by Dr. Manjeet Mann and Ms. Aastha Vats. Principal of the college Mrs. Rachna Arora motivated the girl students to participate more and more.

On the second day of the workshop organized by the Entrepreneur Cell, Ms. Gayatri Arya explained in detail to the students about share trading, caution in buying mutual funds and gold, demat registration with SEBI and the system of investing in mutual funds. She also made the students aware about the cheating in gold. Showing interest in this topic, the students also asked questions related to it to Ms. Gayatri Arya. Dr. Manjeet Mann, Ms. Aastha Vats, Ms. Neerja Parmar and Ms. Nikki were present on that occasion.

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ENTREPRENEUR CELL

Organises

TWO DAYS WORKSHOP

On

ENTREPRENEURER SKILLS

(6th and 7th May 2022)

KEYNOTE SPEAKERS:-

- *Ms. Fanisha Singla, C.A. (6th May 2022)*
- *SH. Vikram Singh Manager, SBI (7th May 2022)*

Time: - 11:00 AM – 12:00 Noon
Venue: - Room No. – 19

PATRON	CO-ORDINATOR	CONVENER
Ms. Rachna Arora	Dr. Manjeet Maan	Ms. Astha Vats

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Incubation Centre

Adarsh Mahila Mahavidyalaya, Bhiwani, has created a name for itself by maintaining high standard of discipline and performance. to add a Crown to academic, the science department of our college has started with the platform for entrepreneurship that is the incubation Centre.

Adarsh Mahila Mahavidyalaya science incubation centre Bhiwani , intentions at promoting entrepreneurship through converting the novel research Idea into an in-service unit. this centre provides a platform to students facilities and the all other aspiring entrepreneurs aiming to come up with ideas and Technology for setting up a new research world.

Objectives

1. To build their intuition center in college and to instill a startup culture
2. Promoting innovation among the students community and nurturing innovative ideas.
3. To motivate student to promote their creative initiatives and ideas.
4. To encourage staff and students to start knowledge based interdisciplinary research.
5. To create researchawareness among the students by conducting seminars and FTP etc.

Visions

To be a center of excellence that encourage engaging research by providing a platform for entrepreneurship and inculating is research mindset for developing of society.

Mission

1.To build a positive space to incubate and support innovative ideas to promote research field.

2.To create an entrepreneurship opportunities for promoting research work including students and faculty members.

3.To provide necessary support and facilities for startups and to promote technical ventures.

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Projects done in session 2018-2019:

S.No.	Name of the start up	Department	Year
1	Calculation of Acceleration due to Gravity(g) Using Bar Pendulam of Different Material	Physics	2018-2019
2	To Study the structural properties of PZT	Chemisty	2018-2019

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CALCULATION OF ACCELERATION DUE TO GRAVITY (g)

USING BAR PENDULAM OF DIFFERENT MATERIAL

BACHELOR OF SCIENCE (N.M)

AADRASH MAHILA MAHAVIDYALYA

BY

CHAVI , MUSKAN

(2212) (2214)

UNDER THE SUPERVISION OF

DEPARTMENT OF PHYSICS

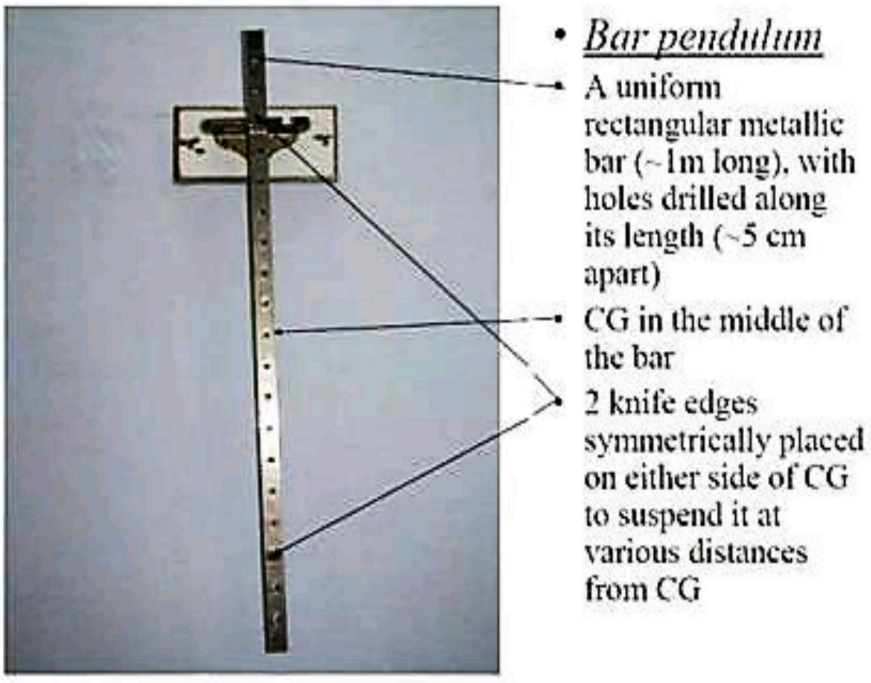
1 INTRODUCTION

PENDULUM:-

It is a weight suspended from a pivot so that it can swing freely. When a pendulum is displayed sideways from its resting or equilibrium position, it is subjected to a restoring force due to gravity that will accelerate it back toward the equilibrium position. When released, the restoring force acting on the pendulum's mass cause it to oscillate about the equilibrium position, swinging back and forth.

The time for one complete cycle, a left swing and right swing is called the period. The period depends on the length of the pendulum and also to a slight degree on the amplitude and on the width of the pendulum's swing.

A bar pendulum is the simplest form of compound pendulum. It is in the form of a rectangular bar (with its length much larger than the breadth and the thickness) with holes (for fixing the knife edges) drilled along its length at equal separation. It is used in finding time in wall clock and also used in crank of engine. [1]



TYPES OF PENDULUM:-

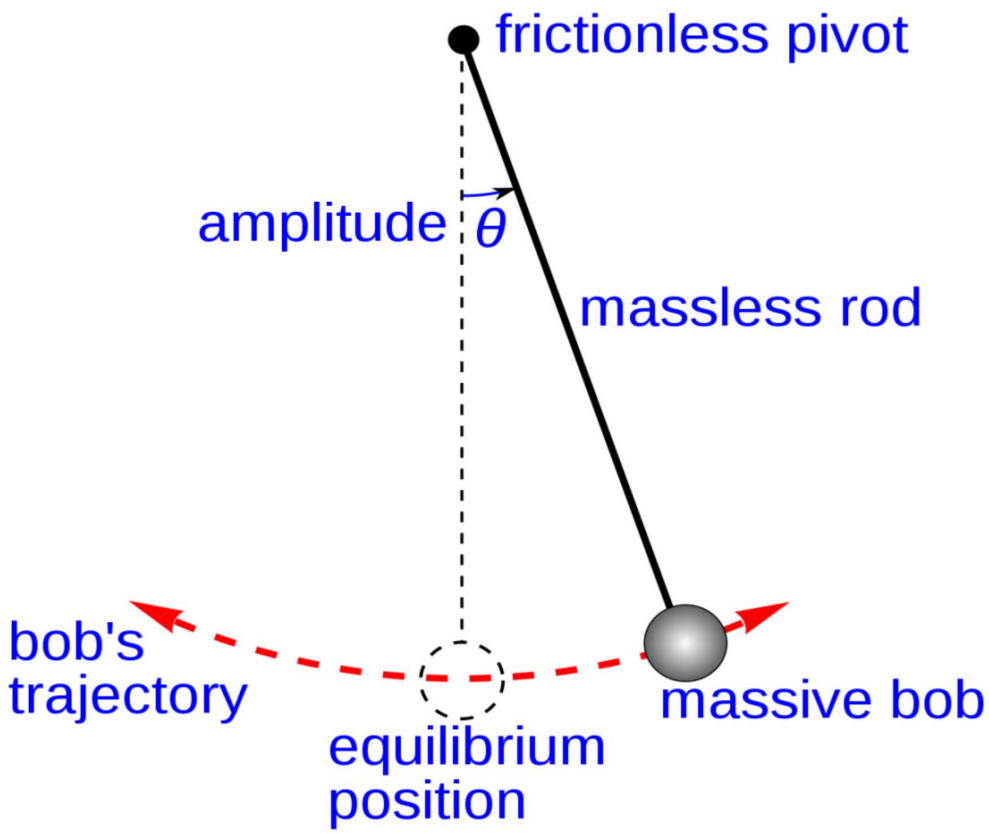
CONTENTS

A pendulum consists of an object suspended along an axis so that it is able to move back and forth freely. Depending on the shape of the pendulum, a pendulum is classified as [2]

1. Simple Pendulum
2. Compound Pendulum

SIMPLE PENDULUM :-

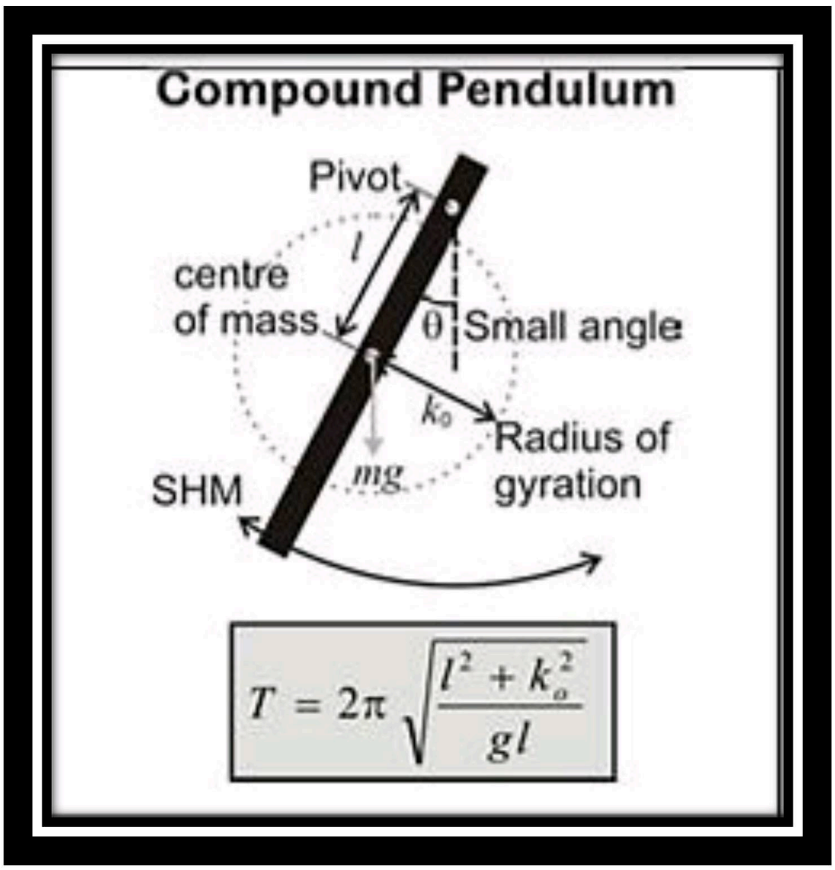
In a simple pendulum the dimensions of the object in suspension is significantly smaller than the distance from the center of gravity of the object to the axis of suspension. This allows us to treat mass as though it were a single point. A simple pendulum is a heavy point mass suspended from a rigid support by a massless and inextensible string. The frequency of simple pendulum depends upon length of a string and acceleration due to gravity.[3]



COMPOUND PENDULUM :-

It is also known as physical pendulum. In a compound pendulum, the distance between the centre of gravity of the swinging body and the axis of suspension is comparable to the dimensions of the body. The compound pendulum is a body which is able to oscillate about a

horizontal axis through it. The frequency of compound pendulum depends upon radius of gyration, mass of pendulum and acceleration due to gravity. [4]



The main difference between simple and compound pendulum is that in a simple pendulum the distance between the centre of gravity of the suspended body and the axis of suspension is large as compared to the dimensions of the suspended body whereas in a compound pendulum the dimensions of the suspended body are comparable to the distance between the body's centre of gravity and the axis of suspension. [5]

Difference between Bar Pendulum and Compound Pendulum

Compound pendulum is just a bit of a misnomer of a pendulum that moves as a single rigid body (however many pieces it is actually made out of), and where the moment of inertia relative to the pivot is not concentrated in a bob that can be modeled as a point mass, but is distributed around. Provided it moves as a single rigid body (no extra hinges) a bar pendulum is presumptively a compound pendulum, because the moment of inertia of the bar has to be allowed for in addition to that of any mass at the tip. [6]

SECONDS PENDULUM :-

Second's pendulum was used in vintage clock which advanced 1 second, every time the pendulum reached on extreme position. Since the pendulum reaches its extreme position twice in 1 oscillation, the time period of a second pendulum is 2 seconds. [7]

ACCELERATION DUE TO GRAVITY IN BAR PENDULUM:-

g is the average acceleration near the Earth's surface, due to gravity. It's the same for any kind of pendulum near Earth's surface; a physical constant (more or less), not a property of the pendulum. A simple pendulum is an easy way to calculate the acceleration due to gravity wherever you find yourself. This can be accomplished because the period of a simple pendulum is related to the acceleration due to gravity by the equation [8]

$T = 2\pi \sqrt{L/g}$

Where T= time period

L= length of pendulum

g= acc. due to gravity

How does g affect pendulum?

Gravity is the consistent force that always pulls downward on the pendulum, whether it is at rest or in motion. Partly due to the force of gravity, the pendulum swings side to side in a

rounded motion. The other force acting on the pendulum is the tension force due to string that holds the weight.

What causes the pendulum to eventually stop?

Gravity is the force that causes a pendulum to stop swinging. However, gravity is not a force. It is simply a directional loss of energy. The Earth is a huge energy sink, and it absorbs nearly all energy emitted by the pendulum immediately. The pendulum must have energy added to it in order to overcome its own inertia and change its momentum, but sooner or later the pendulum runs out of energy. When this happens, the pendulum settles into its normal momentum, pointing in the direction of Earth, and with its velocity overcome by the point of suspension. So, directional energy loss results in momentum change (direction and

velocity), which presents the illusion of some sort of 'force' (gravity) acting upon the pendulum to bring it to a stop.

2 **Formula used and procedure:**

The acceleration due to gravity is given by

$$g = 4\pi^2 \frac{L}{T^2}.$$

Procedure

1.Balance the bar on a sharp wedge and mark the position of its C.G.

2.Fix the knife edges in the outermost hole, at either end of the bar pendulum. The knife edges should be horizontal and lie symmetrically with respect to centre of gravity of the bar.

3.Check with spirit level that the glass plates fixed on the suspension wall bracket are horizontal. The support should be rigid.

4.Suspend the pendulum vertically by resting the knife edge at end A of the bar on the glass plate.

5.Adjust the eye piece of the telescope so that the cross wires are clearly visible through it. Focus the telescope on the lower end of
the bar and put a reference mark on the wall behind the bar to denote its equilibrium position.

6.Displace the bar slightly to one side of the equilibrium position and let it oscillate with the amplitude not exceeding 5 degrees. Make sure that there is no air current in the vicinity of the pendulum.

7.Use the stop watch to measure the time for 30 oscillations. The time should be measured after the pendulum has had a few oscillations and the oscillations have become regular.

8.Measure the distance l from C.G. to the knife edge.

9.Record the results in Table 1. Repeat the measurement of the time for 30 oscillations and take the mean.

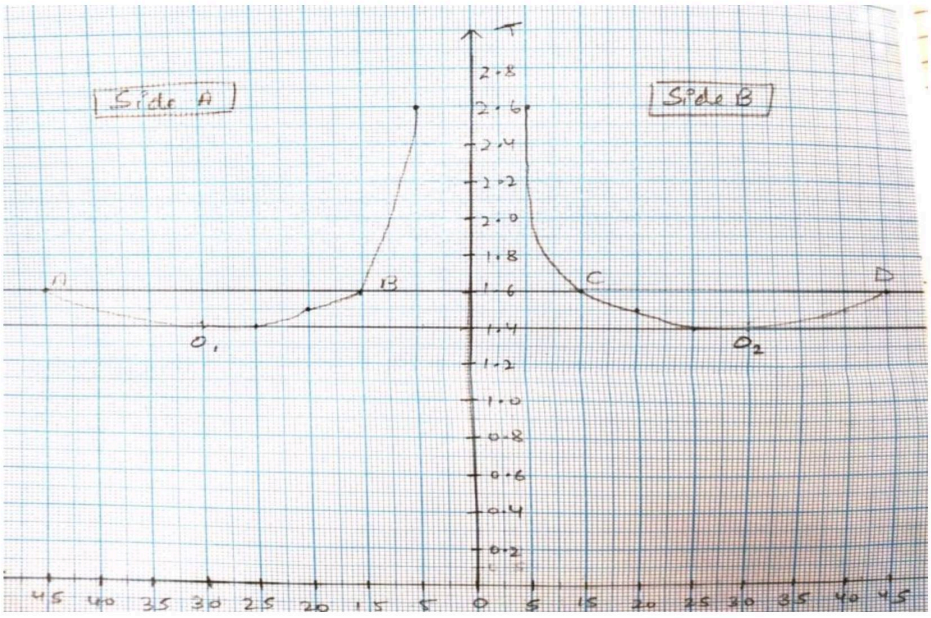
10.Suspend the pendulum on the knife edge of side B and repeat the measurements in steps 6 -9 above.

11.Fix the knife edges successively in various holes on each side of C.G. and in each case, measure the time for 30 oscillations and the distance of the knife edges from C.G.

3. OBSERVATION AND TABLE

Table1 :- BAR PENDULUNM

s.no.	Distance from C.G. (cm)	Side A of bar pendulum				Side B of bar pendulum			
		Time for 20 vibrations			Time period	Time for 20 vibrations			Time period
		(i)	(ii)	Mean	T	(i)	(ii)	Mean	T
1.	45cm	32s	32s	32s	1.6s	32s	32s	32s	1.6s
2.	40cm	30s	30s	30s	1.5s	30s	30s	30s	1.5s
3.	35cm	30s	30s	30s	1.5s	30s	30s	30s	1.5s
4.	30cm	29s	29s	29s	1.45s	29s	29s	29s	1.45s
5.	25cm	28s	28s	28s	1.4s	28s	28s	28s	1.4s
6.	20cm	31s	31s	31s	1.55s	31s	31s	31s	1.55s
7.	15cm	33s	33s	33s	1.65s	33s	33s	33s	1.65s
8.	10cm	38s	38s	38s	1.9s	38s	38s	38s	1.9s
9.	5cm	53s	53s	53s	2.65s	53s	53s	53s	2.65s



calculations

from the graph , time period T = 1.6s

Length AC = 60cm

Length BD = 60cm

Mean length = 60 cm

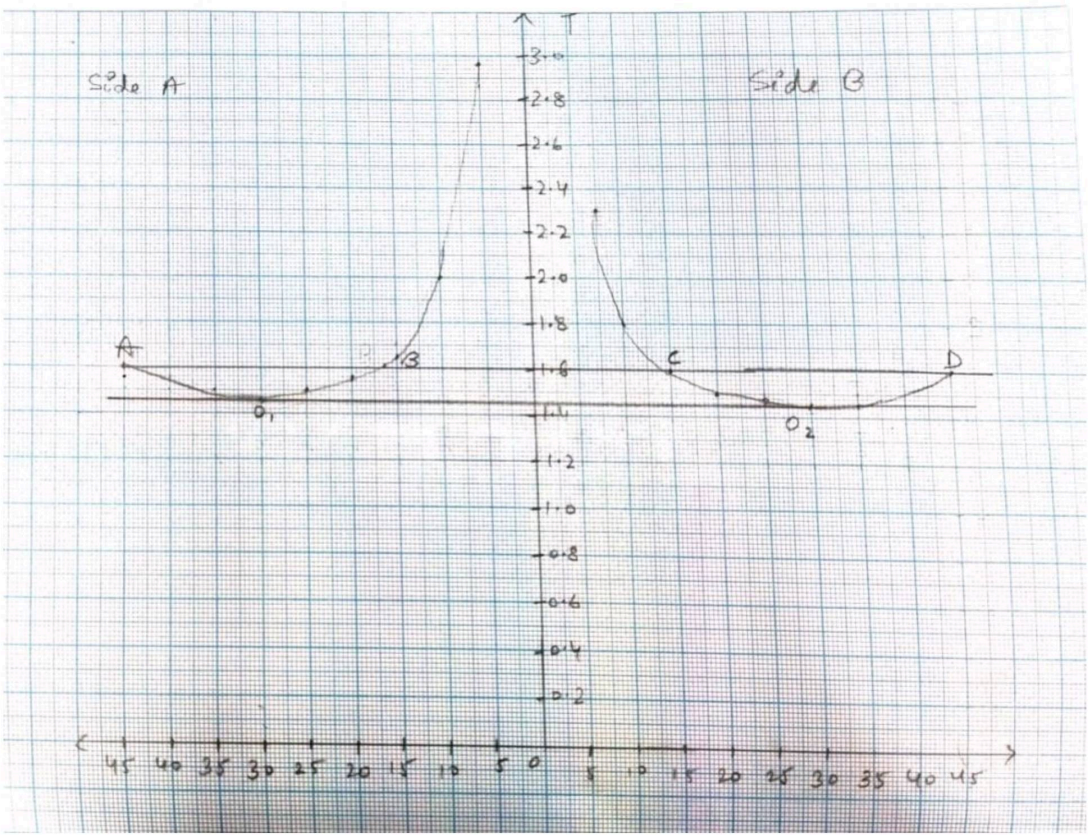
$g = 4\pi^2 (L/T^2) = 4\times (3.16)^2 (60/(1.6)^2) = 936.15 \text{ cm/s}^2 = 9.3615 \text{ m/s}^2$

Standard value of $g = 9.8 \text{ m/s}^2$

% error = 9.8 – 9.3615 ×100/9.8 = 4.47%

Table 2 :- BAR PENDULUNM USING WOOD AS MATERIAL

s.no.	Distance from C.G. (cm)	Side A of bar pendulum				Side B of bar pendulum			
		Time for 20 vibrations			Time period	Time for 20 vibrations			Time period
		(i)	(ii)	Mean	T	(i)	(ii)	Mean	T
1.	45cm	31s	31s	31s	1.55s	31s	31s	31s	1.55s
2.	40cm	30s	30s	30s	1.5s	32s	32s	32s	1.6s
3.	35cm	30s	30s	30s	1.5s	30s	30s	30s	1.5s
4.	30cm	29s	29s	29s	1.45s	29s	29s	29s	1.45s
5.	25cm	30s	30s	30s	1.5s	30s	30s	30s	1.5s
6.	20cm	31s	31s	31s	1.55s	30s	30s	30s	1.5s
7.	15cm	34s	34s	34s	1.7s	32s	32s	32s	1.6s
8.	10cm	40s	40s	40s	2s	36s	36s	36s	1.8s
9.	5cm	59s	59s	59s	2.95s	45s	45s	45s	2.25s



calculations

from the graph , time period T = 1.55s

Length AC = 60cm

Length BD = 60cm

Mean length = 60 cm

$g = 4\pi^2 (L/T^2) = 4\times (3.16)^2 (60/(1.55)^2) = 996.46 \text{ cm/s}^2 = 9.9646 \text{ m/s}^2$

Standard value of $g = 9.8 \text{ m/s}^2$

% error = $9.8 - 9.9646 \times 100/9.8 = 1.67\%$

a) Bar pendulum b) bar pendulum by using wood material

Figure:- Experiment performed by students for different pendulum

Difference between both the bar pendulums

= 4.47% - 1.67% = 2.8%

Result

=The value of acceleration due to gravity (g) using simple bar pendulum is **9.3615** $m/s^{2.}$

= The value of acceleration due to gravity (g) using wooden bar pendulum **9.9646** is $m/s^{2.}$

Reference:-

1. https://en.m.wikipedia.org/wiki/Pendulum
2. https://www.studyrankersonline.com/93084/what-is-difference-between-simple-pendulum-and-compound-pendulum
3. https://www.studyrankersonline.com/93084/what-is-difference-between-simple-pendulum-and-compound-pendulum
4. https://www.studyrankersonline.com/93084/what-is-difference-between-simple-pendulum-and-compound-pendulum
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8. https://en.m.wikipedia.org/wiki/Pendulum
9. https://www.quora.com/What-causes-the-pendulum-to-eventually-stop

TO STUDY THE STRUCTURAL PROPERTIES OF PZT

BACHELOR OF SCIENCE
IN
PHYSICS

BY

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UNDER THE SUPERVISION

OF

DEPARTMENT OF PHYSICS

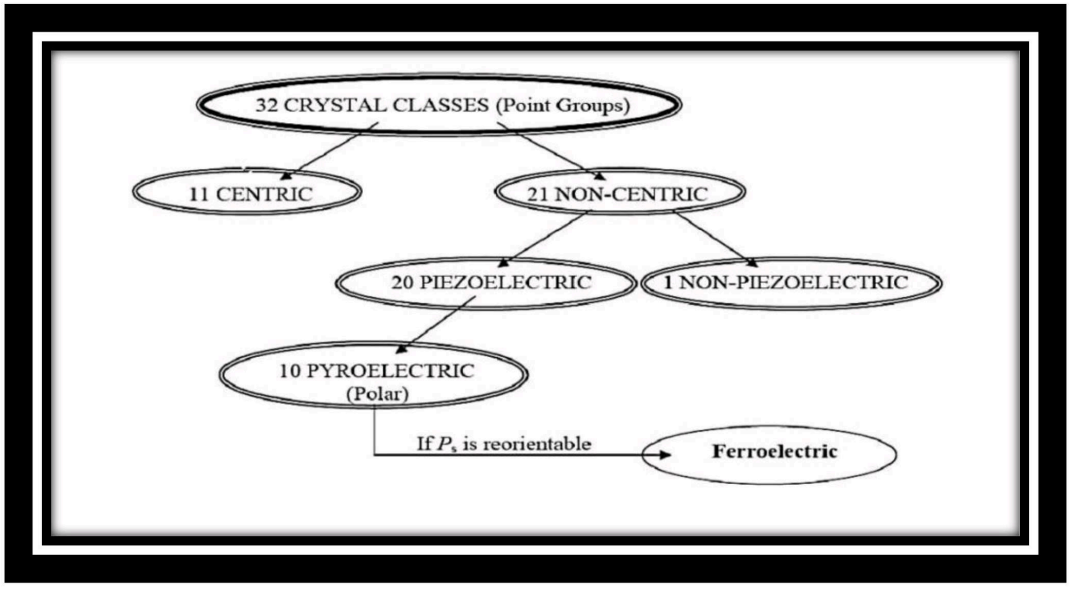
Crystal Symmetry

The external shape of a crystal reflects the presence or absence of translation free symmetry elements in its unit cell.

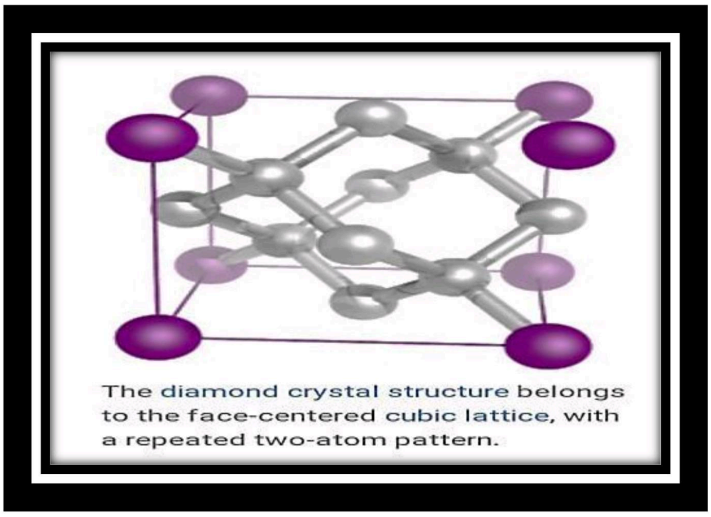
→ While not always immediately obvious, in most well formed crystal shapes,Axis of rotation, axis of rot inversion, center of symmetry, and mirror plans can be spotted.

All the seven crystal system can be divided into 32 different classes known as point groups based on the symmetry elements responsible for the existence of these point groups are:-

a) Centre of symmetry.
b) Axes of rotation.
c) Mirror planes.
d) Compatible combination of all these 32 point groups can be categorized into centrosymmetric and Non-centrosymmetric type. These classes include 21 point groups out of which 20 are piezoelectric. Among 20 piezoelectric classes, ten points group's properties.



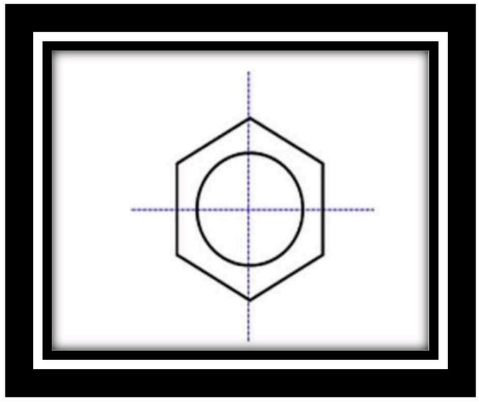
In crystallography, the terms crystal system, crystal family and lattice system each refer to one of several classes of space groups, Lattice, point groups, or crystals. Informally, two crystals are in the same crystal system if they have similar symmetries, although there are many exceptions to this.



Crystal systems, crystal families, and lattice systems are similar but slightly different, and there widespread confusion between them: in particular trigonal crystal system is often confused with the rhombohedral lattice system, and the term ‘’crystal system is sometimes used to mean ‘’lattice system or crystal family.

- **Centric**

In crystallography, a centric point group contains an inversion center as one of its symmetry elements. In such a point group, for every point in the unit cell there is an indistinguishable point. Such point groups are also said to have inversion symmetry. Point reflection is a similar term used in geometry. crystals with an inversion center cannot display certain properties, such as the piezoelectric effect.



The following space groups have inversion. Symmetry; the triclinic space group 2, the monoclinic 10-15, the orthorhombic 47-74, the tetragonal 83-88 and 123-142, the trigonal 147,148 and 162-167, the hexagonal 175,176 and 191-194, the cubic 200-206 and 221-230.

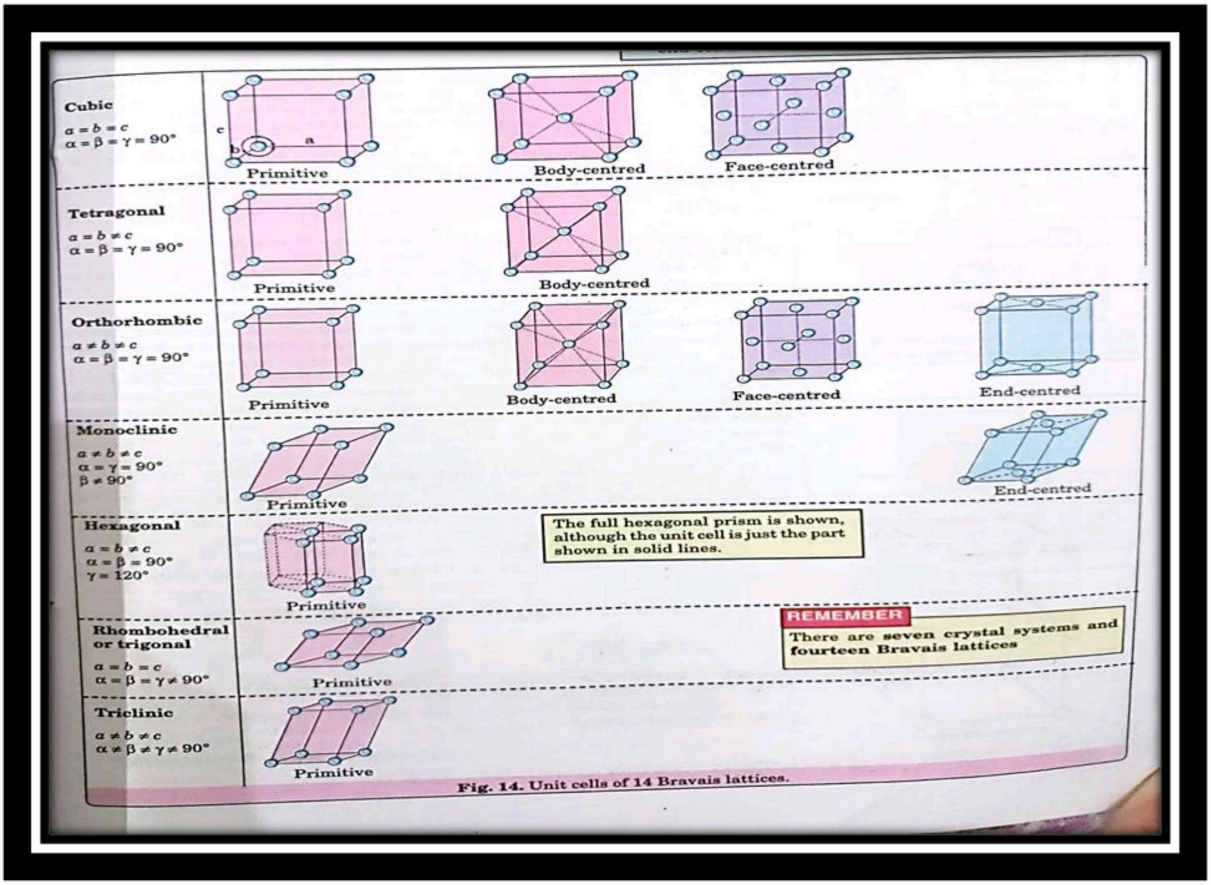
- **Non-centric**

These are the point groups looking an inversion center are called non-centric these can be polar, chiral, both or neither.

A polar point group symmetry operation leaves more than one common point unmoved. A polar point group has no unique origin because each of those unmoved points can be chosen as one. One or more unique polar axes could be made through two such collinear unmoved points. Polar crystallographic point group include 1,2,3,4,6,m,mm2,3m,4mm,and 6mm.

Space groups & crystals are divided into seven crystal systems according to their point groups and into seven lattice systems according to their Bravais lattices.

- **Bravais lattices-**There are seven different kinds of crystal systems, and each kind of crystal system has 4 different kinds of centering (Primitive, base-centered, Body centered, face centered) However, not all the combinations are unique some of the combinations are equivalent while other combinations are not possible due to symmetry reasons. This reduces the number of unique lattices to the 14 Bravais lattices. The distribution of the 14 Bravais lattices into lattice systems and crystal families is given



- **<u>Piezoelectric-</u>**The Piezoelectric effect results from the linear electromechanical interactions between the mechanical & electrical states in crystalline materials with no inversion symmetry. The piezoelectric effect is a reversible process materials exhibiting the piezoelectric effect also exhibit the reverse piezoelectric effect the internal generation of a mechanical strain resulting from an applied electric field example-Lead zirconatetitanate.
- Out of those 20 piezoelectric groups 10 of these represent the polar crystal classes, which show a spontaneous polarization without mechanical stress due to a Non-vanishing electric dip lament associated with their unit cell, & which exhibit piezoelectricity if the dipole moment can be reversed by applying an external electric field, the material is said to be ferroelectric.

<u>Piezoelectricity</u>

The term Piezoelectricity has been derived from the Greek ward ‘piezo’ or ‘piezein’ which means to press. It is defined as an ability of a material to develop an electric change when is subjected to mechanical stress. The direct effect is designated as generator action & was first discovered by Jacques and P.curie in 1880. It was also exists i.e. a material produces a geometrical strain when is subjected to an external applied voltage and the converse effects is known as motor action.

Piezoelectric balance presented by Pierre Curie to Lord Kelvin, Hunterian Museum, Glasgow

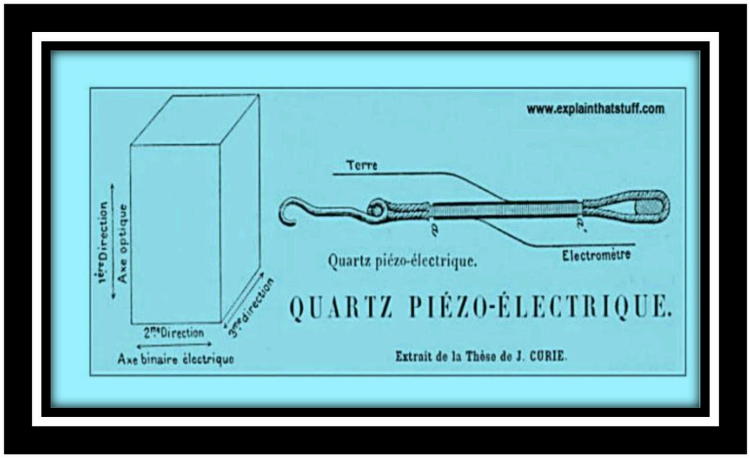
It is the electric charge that accumulates in certain solid materials such as crystals, certain ceramics, & biological matter such as bone, DNA & various proteins in response to applied mechanical stress this ward Piezoelectricity means electricity resulting from pressure & latent heat. The piezoelectric effect results from the linear electromechanical interaction b/w the mechanical& electrical states in crystalline materials with no inversion symmetry. It is a reversible process. The internal generation of a mechanical strain resulting from an applied electrical field. The inverse piezoelectric effect is used in the, production of ultrasound waves.

The piezoelectric effect has been exploited in many useful applications, including the production & detection of of sound, piezoelectric inkjet printing, generation of high voltage electricity, as a clock generator in electronic devices, in microbalances, to drive an ultrasonic nozzle and in ultrafine focusing of optical assemblies. It farms the basis for scanning probe microscopes that

resolve images at scale of atoms. The piezoelectric effect also finds everyday uses, such as generating sparks to ignite gas cooking & heating devices, torches & cigarette lighters. [1]

- **Who discovered piezoelectricity**

The piezoelectric effect was discovered in 1880 by two French physicists, brothers Pierre and Paul-Jacques curie, in crystals of quartz, Tourmaline and Rochelle salt (potassium, sodium tartrate). They took the name from the Greek work piezein , which means ‘’ to press’’ Jacques summed up the observation in an 1889 paper in annals de Chimie de physique. ‘If one polls or squeezes along the main axis (of a quartz block) there appears at the ends of this axis equal quantities of electricity of opposite signs, proportional to the acting force & independent of the dimensions of the dimensions of the quartz’’.[2]



- **How piezoelectricity works**

1. Normally, the charges in a piezoelectric crystal are exactly balanced, even if they are not symmetrically arranged.
2. The effects of the Charges exactly cancel out, leaving no net charge on the crystal faces.
3. If you squeeze the crystal, you force the charges out of balance.
4. Now the effects of the charges no longer cancel one another out and net positive and negative charges appear on opposite crystal faces. By squeezing the crystal, you have produced a voltage across its opposite faces- and that is piezoelectricity.[2]

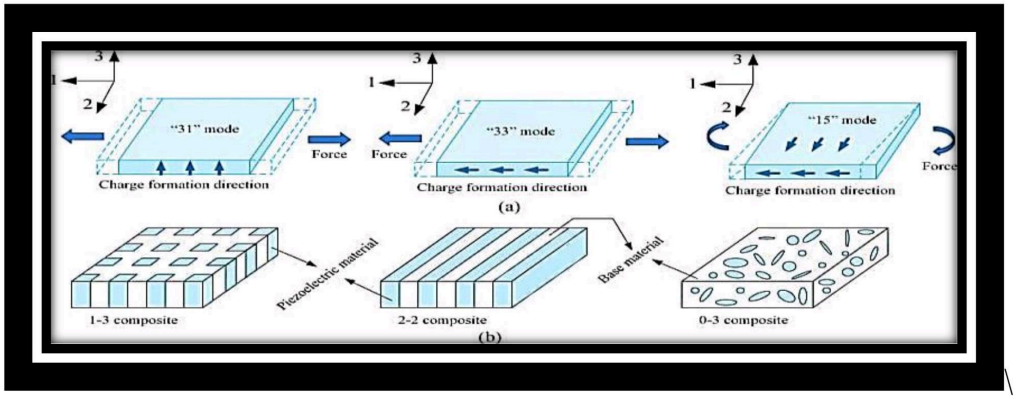
- **Piezoelectric materials**

Piezoelectric effect is the ability of certain materials to generate an electric change in response to applied mechanical stress.

There are many materials, both natural and man-made, that exhibit a range of piezoelectric occurring materials include Berlinite (structurally identical to quartz) Cane sugar, Quartz, Rochelle, Salt, Topaz, Tourmaline, & bone.

An example of man-made piezoelectric materials includes barium titanate and lead zirconate titanate.

In recent years, due to the growing in environmental concern regarding toxicity in lead-containing devices and the ROHS directive followed within the European union, there has been a push to develop lead free piezoelectric materials has resulted in a variety of new piezoelectric materials which are more environmentally safe.[3]



Piezoelectric advantages and disadvantages

Compared to other electronic components, piezoelectric devices have several advantages as well as some disadvantages.

Their advantages include the following aspects:

- No external power source required

Thanks to their ability to produce a voltage when acted upon by a force, piezo materialsrequire no external power source

- Easy installation

With small dimensions, they are a great fit and easily installed in high-density electronic devices.

- Responsiveness to high frequencies

Compared toother devices, piezo materials have a substantially higher: frequency response which makes them wonderfully responsive in even the most demanding situations.

- Small amount of electric charge

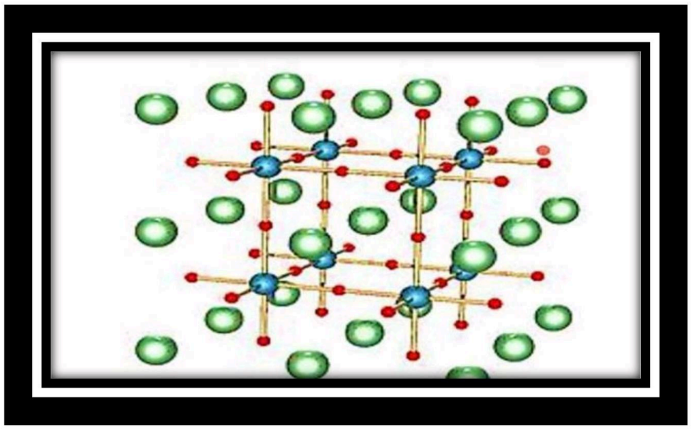
Through they are self-generating; piezo materials produce fairly small electric charges, which mean a high impedance cable is required to connect them to an electrical interface.

- Output is relatively law

While some piezomaterials produce more output than others, they are all relatively low. For their use to be optimized, an external circuit will often be required.[4]

Perovskite

A perovskite is any material with a crystal structure similar to the mineral called perovskite, which consists of calcium titanium oxide (CaTiO3). The mineral was first discovered in the UralMountains of Russia by Gustav rose in 1839 & named after Russian mineralogist L.A perovskite. The general chemical formula for perovskite compounds is ABX3, where 'A' atoms are two ions, often of very different sizes, & x is an ions. The 'A' atoms. The ideal cubic structure has the B cation in 6-fold coordination, surrounded by an octahedron of anions and the A cation in 12 fold cuboctahedra coordination.



As one of the most abundant structural families, perovskite are found in an enormous no. of compounds which have wide-ranging properties, applications and importance natural compounds with this structure are perovskite , loparite and the silicate perovskite bridgmanite.[5]

- **Classification of perovskites**

A classification of perovskite type structures on the basis of the radii of the constituent metallic ions has been attempted by several workers. Due to the flexibility of the ABO_3 perovskite crystal structure in addition to its ability to accommodate a wide range of cations with different oxidation states.

The opportunity for several substitutions at the position of the cations is the main characteristic of perovskites which lead to the occurrence of big groups of compounds with dissimilar cations in B position ($AB_xB_{1-x}o_3$); with different cations in A position ($A_xA_{1-x}BO_3$); and with substitution in both cation position ($A_xA_{1-x}B_xB_{1-x}O_3$).[6]

Properties

Perovskite materials exhibit many interesting properties due to its characteristic chemical nature such as; their Non-stoichiometry of the anions &/or cations, the valence mixture electronic structure, the distortion of the cation configuration, and the mixed valence. The possibility of perovskite to synthesizing multicomponent by partial substitutions of cations in positions A & B gives rise to various complex types with peculiar properties such as; Dielectric properties, Optical properties, ferroelectricity, super conductivity, Piezoelectricity, Catalytic activity.[6]

Dielectric Properties

Dielectric materials are the materials in which electro-static fields can persevere for long time. It showed a great resistance to electric current channel below the action of the applied direct current voltage &diverges sharply in their simple electrical properties from conductive electrical. Layers of these substances to generally inserted into capacitors to improve their performance, & the term dielectric refers to this application.[6]

Optical Properties

Perovskite have provided very special class of materials with excellent optical and photoluminescence properties. Studying the optical properties of single domain crystals of **$BaTiO_3$** at various temperatures showed that refractive index of the crystal was nearly a constant value from 20^0C. The single crystal of $BaTiO_3$, 0.25mm thick was found to transmit from O.S.U to 6u. The optical coefficient of strontium titanate single crystals was obtained from 0.20µ to 17µ wavelength. [6]

Material Properties

Perovskite materials exhibit many interesting and intriguing properties from both the theoretical and the application point of view. Colossal ,Magnetoresistance ,Ferroelectricity, Superconductivity, charge ordering, spin dependent transport, high thermospower and the interplay of structural, magnetic & transport properties are commonly observed features in this family. These compounds are used as sensors and catalyst electrodes in certain types of fuel cells and are candidates for memory devices and spintronic applications.[5]

Applications

Perovskite oxides type are wide applications due to its stable structure, large no. of compounds, variety of properties. Inorganic perovskite type oxides are attractive nanomaterial for varied applications due to its large no. of compounds, very stable structure, variety of properties & several practical applications. Some of these compounds nanomaterial are widely applied in catalyst of many chemical engendering fields. The activity of these oxides as catalyst is better than any other transition metals & previous metal oxides. Recently, they utilized in electrochemical sensing of alcohols, acetone, glucose, amino acids, H2o2, sensitivity, excellent

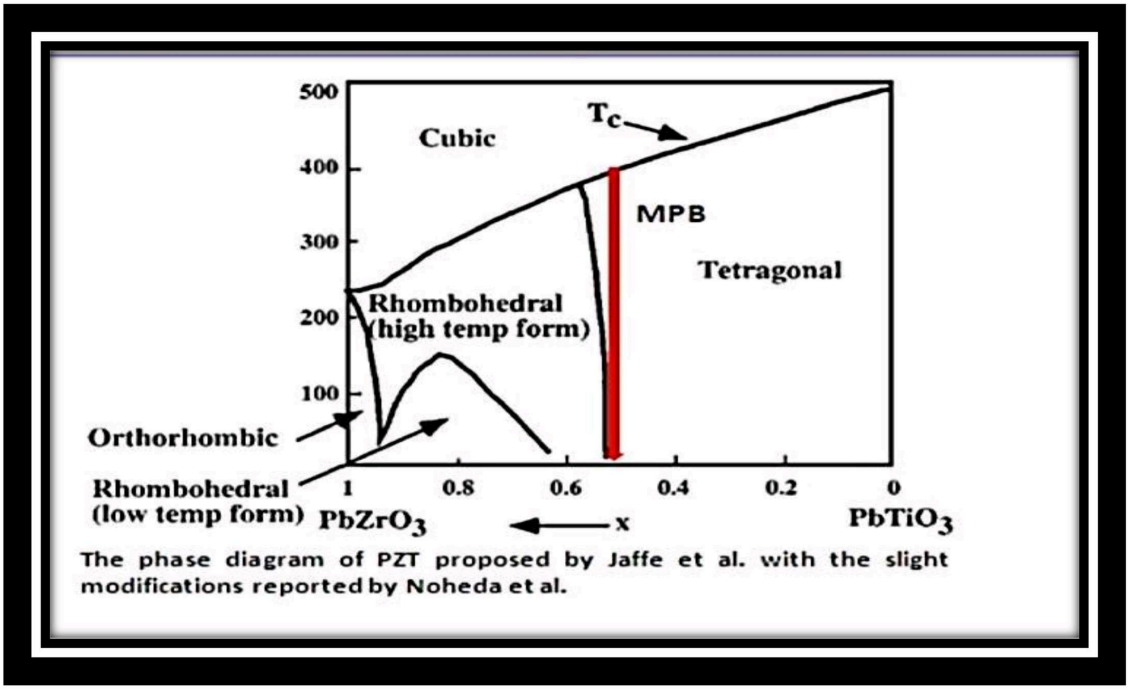
reproducibility, unique long term stability, anti-interference ability and neurotransmitters exhibiting good selectivity, etc.[6]

Examples of perovskites

1) Strontium titanate.
2) Calcium titanate.
3) Lead titanate.
4) Bismuth ferrite.
5) Lanthanum ytterbium oxide.
6) Silicate perovskite.
7) Lead zirconatetitanate.
8) Methylammonium lead halide.
9) Lanthanum manganite.
10) Lead scandium tantalite.[5]

PZT and morphotrophic phase boundary (MPB)

Lead based perovskite ferroelectrics such as PZT and their solid solution exceptionally high ferroelectric and piezoelectric behavior and they are best suited for technological applications such as sensors and actuator. Lead zirconatetitnate (PZT) is a distorted cubicperovskite structure and is a result of solid solution of lead titanate, PT(PbTiO3) and lead Zirconate, PZ (Pbzr03). These ceramics exhibit a peculiar boundary coined as ‘Morphotropic phase boundary’ MPBby Jaffe et al. The proposed phase diagram of PZT by Jaffe et al. is represented -



The phase diagram of PZT proposed by Jaffe et al. with the slight modifications reported by Noheda et al.

Ferroelectric perovskite, Morphotropic phase boundary (MPB) $Pb(Zr,Tc)O_3$ (PZT) based ceramics are the basis of a wide range of piezoelectric technologies, such as sensors, actuators, smart system, ultrasound generation and sensing and underwater acoustics (setter,2002). Their high electromechanical activity is associated with the presence of a monoclinic phase in the MPB region between the rhombohedral and the tetragonal phase (Noheda, etal.2000).

This is the some mechanism responsible for the ultra-high piezoelectricity, d_{33} coefficient>1500pc/n of the rhombohedral $Pb(Zn_{1/3}Nb_{2/3})O_3$-$PbTi0_3$(PZN-PT) and $Pb(Mg_{1/3}Nb_{2/3})O_3$ -$PbTi0_3$ (PMN-PT) single crystal and textural ceramics near or in their respective MPBS. The commercial PZT based ceramics with the highest sensitivity are the so-called soft PZT, for which the d33 piezoelectric coefficient is raised from-200c/n up to 600pc/n by composition engineering of the curie temperature, 1082). Piezoelectric devices are not oblivious to the current miniaturization trends in ceramic technology for capacitor (MLCC) are being downscaled and an analogous trend can be anticipated for ,multilayers ceramic actuators (MLCA) and for other piezoelectric device configurations (Uchino, 1998). This technological trend benefits from the scaling behavior of piezoelectricity. Longitudinal deformation under a given voltage does not depend on size and thus, the down scaling of a MLCA does not affect the

piezoelectric response also the total displacement is proportional to the number of layers and so, there is a general driving force to reduce the thickness.[7]

The composition-temperature phase diagram of PZT is mainly comprised of two ferroelectric regions. One is Zr rich rhombohedral phase and the other phase consists of Ti rich tetragonal phase. These two ferroelectric phases are separated by MPB which was earlier believed to be a coexistence region of these two phases. The PZT solid solutions with Compositions near MPB have been of peculiar interest due to their excellent dielectric and piezoelectric properties in this region.

Applications -

The nonlinear nature of ferroelectric material can be used to make capacitor with adjustable capacitance. Typically, a ferroelectric capacitor simply consists of a pair of electrodes sandwiching a layer of ferroelectric material. The permittivity of the ferroelectrics is not only adjustable but commonly also very high, especially when close phase transition temperature. Because of this, ferroelectric capacitors are small in physical size compared to dielectric capacitors of similar capacitance.

Ferro electricity is a characteristic of certain materials that have a spontaneous electric polarization that can be reversed by the application of an external electric field. All the Ferro electrics are pyroelectric, with the additional property that their natural electrical polarization is reversible. The term is used in analogy to ferromagnetism.

The applications for Ferro electric ceramics as well as thin film are manifold and cover all area of bulk and thin electronic material have been represented in the flowchart.[8]

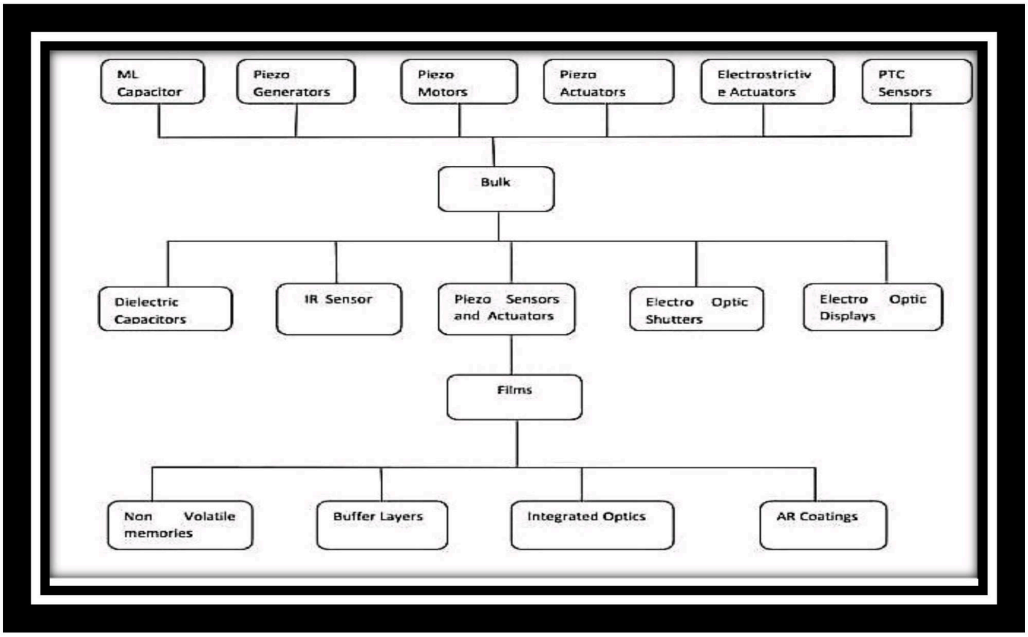


Fig: -Application ceramic bulk and film electronic materials.

They have been exploited for their excellent properties such as piezoelectric, pyroelectric, ferroelectric, electrictrostrictive and electro properties.

Reference

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Projects done in session 2019-2020:

S.No.	Name of the startup	Department	Year
1	Preparation of Rayon from Filter Paper	Chemistry	2019-2020
2.	Extraction and isolation of DNA from different plant products	Bio-Sciences	2019-2020

Principal
Adarsh Mahila Mahavidyalaya
Bhiwani

Preparation of Rayon from filter paper

Bachelors of Science
Session: 2019-2020
Supervisor:
Mrs. Rachna Arora
(Assistant Professor)
Dr. Ritika Chaudhary
(Assistant Professor)
Department of Chemistry
Adarsh Mahila Mahavidalaya, Bhiwani

Submitted by:
Tanya, Vandana Goyal

AIM OF THE PROJECT

The main objective of the project is to illustrate the preparation of rayon by the cuprammonium process. Instead of wood pulp as the cellulose source, attempt is done to make use of raw cellulose products such as waste paper (un-printed), filter paper etc.

Content:

- Introduction
- Theory
- Rayon Fiber Properties
  - Physical Properties
  - Chemical Properties
- Applications
- Apparatus Required
- Chemical Required
- Procedure
- Result

Introduction

Cellulose is nature's own giant molecule. It is the fibrous material that every plant from seaweed to the sequoia makes by baking glucose molecules in long chains; the chains are bound together in the fibers that give plants their shape and strength. Wood has now become the main source of cellulose. Since it contains only 40% to 50% cellulose, the substance must be extracted by 'pulping'. The logs are flaked, and then simmered in chemicals that dissolve the tarry lignin, resins and minerals. The remaining pulp, about 93% cellulose, is dried and rolled into sheets-raw material for paper, rayon and other products. It can be obtained in 2 ways.

1 Viscose Process:

Cellulose is soaked in 30% caustic soda solution for about 3 hrs. The alkali solution is removed and the product is treated with CS_2. This gives cellulose xanthate, which is dissolved in NaOH solution to give viscous solution. This is filtered and forced through a spinneret into a dilute H_2SO_4 solution, both of which harden the gum-like thread into rayon fibers. The process of making viscose was discovered by C.F.Cross and EJ.Bevan in 1891.

2 Cuprammonium Rayon:

Cuprammonium rayon is obtained by dissolving pieces of filter paper in a deep blue solution containing tetra-ammine cupric hydroxide. The latter is obtained from a solution of copper sulphate. To it, NH_4OH solution is added to precipitate cupric hydroxide, which is then dissolved in excess of NH_3.

Reactions:

$CUSO_4 + 2NH_4OH \rightarrow Cu(OH)_2 + (NH_4)_2SO_4$

Pale blue ppt

$Cu(OH)_2 + 4NH_4OH \rightarrow [Cu(NH_3)_4](OH)_2 + 4H_2O$

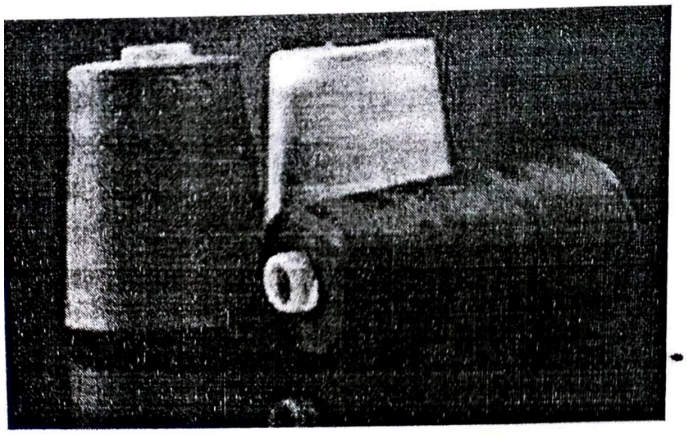
$[Cu(NH_3)_4](OH)_2$ + pieces of filter paper left for 10-15 days give a viscous solution called VISCOSE.

Theory

Of all the fibers, rayon is probably the most perplexing to consumers. It can be found in cotton-like end uses, as well as sumptuous velvets and taffetas. It may function successfully in absorbent hygiene and incontinence pads and equally well providing strength in tire cords.

Rayon was first manufactured fiber. The term rayon was officially adopted by the textile industry. Unlike most man-made fibers, rayon is not synthetic. It is made of wood pulp, a naturally occurring, cellulose based material. As result, rayon's properties are more similar to those of natural cellulose fibers, such as cotton or linen, than those of thermoplastic; petroleum based synthetic fiber such as nylon or polyester.

Although rayon is made from wood pulp, a relatively inexpensive and renewable resource, processing requires high water and energy use, and has contributed to air and water pollution. Modernization of manufacturing plants and processes combined with availability of raw materials has increased rayon's competitiveness in the market.



Rayon Fiber Properties

Physical Properties of Rayon

- **Strength:** The enduringness of viscose nicer is larger than that of wool however is barely 0.5 as great as silk. Viscose is additionally weaker than cotton and its strength is reduced to 40-70% once wet. Nevertheless it produces fairly sturdy, economical and serviceable material whose smoothness of surface favorably withstands with friction of wear and tear
- **Elasticity:** viscose has larger snap than cotton however but wool and silk. Whereas viscose materials have some inherent extensibility, undue strain would possibly cause them to sag or maybe burst.
- **Resilience:** viscose lacks the resilience. It ought to be remembered that the resistance of a material to creasing depends on the type of yarn, weave and finishing method.
- **Drapability :** viscose possesses a marked quality of drivability as a result of its comparatively significant weight material.
- **Heat conduction:** viscose may be a smart conductor of warmth and is so applicable for summer article of clothing like cotton.
- **Absorbency:** viscose is one in every of the foremost absorbent of all textiles. It's additional absorbent than cotton or linen, however but wool and silk.

- **Cleanliness and Wash ability**
  Because of smoothness, viscose fiber helps to supply hygienic materials that shed dirt. Since Viscose rayon quickly loses strength once wet, it should be handled with care once washed.
- **Reaction to Bleaches:** house bleaches containing metal hypo mineral, metal perborate or oxide could also be safely used.
- **Shrinkage:** viscose materials tend to shrink quite cotton materials. Spun viscose materials shrink additional, which may tend a shrink resistant end, like Sanforset.
- **Effect of warmth:** viscose is pure polyose fiber that burns as cotton. Once ironing, solely moderately high temperature should be used.

Chemical Properties of rayon fiber

- **Resistance to Mildew:** Like cotton, viscose have tendency to mildew. Such materials mustn't be allowed to stay in damp conditions.
- **Reaction to alkaline:** focused solutions of alkalis disintegrate viscose. A light soap with lukewarm water is suggested in laundry rayon.
- **Affinity of Dyes:** Viscose materials absorb dye equally and might be colored with a range of dyes, like acid, chrome, and disperse.
- **Resistance to Perspiration:** it's fairly immune to deterioration from perspiration.

Parameters	Comparative Rating		
	Cotton	Viscose	Polyester
Comfort			
Moisture Regain	Good	Very good	Poor
Thermal protection	Good	Very good	Poor
Air permeability	Very good	Good	Poor
Softness	Good	Very good	Poor
Smoothness	Poor	Good	Very good
Static dissipation	Good	Very good	Poor
Aesthetic			
Drape	Good	Very good	Poor
Luster	Poor	Very good	Very good
Crease recovery	Poor	Poor	Very good
Uniformity	Poor	Very good	Good
Utility Performance			
Antipilling	Good	Very good	Poor
Wash & wear	Good	Poor	Very good

Applications

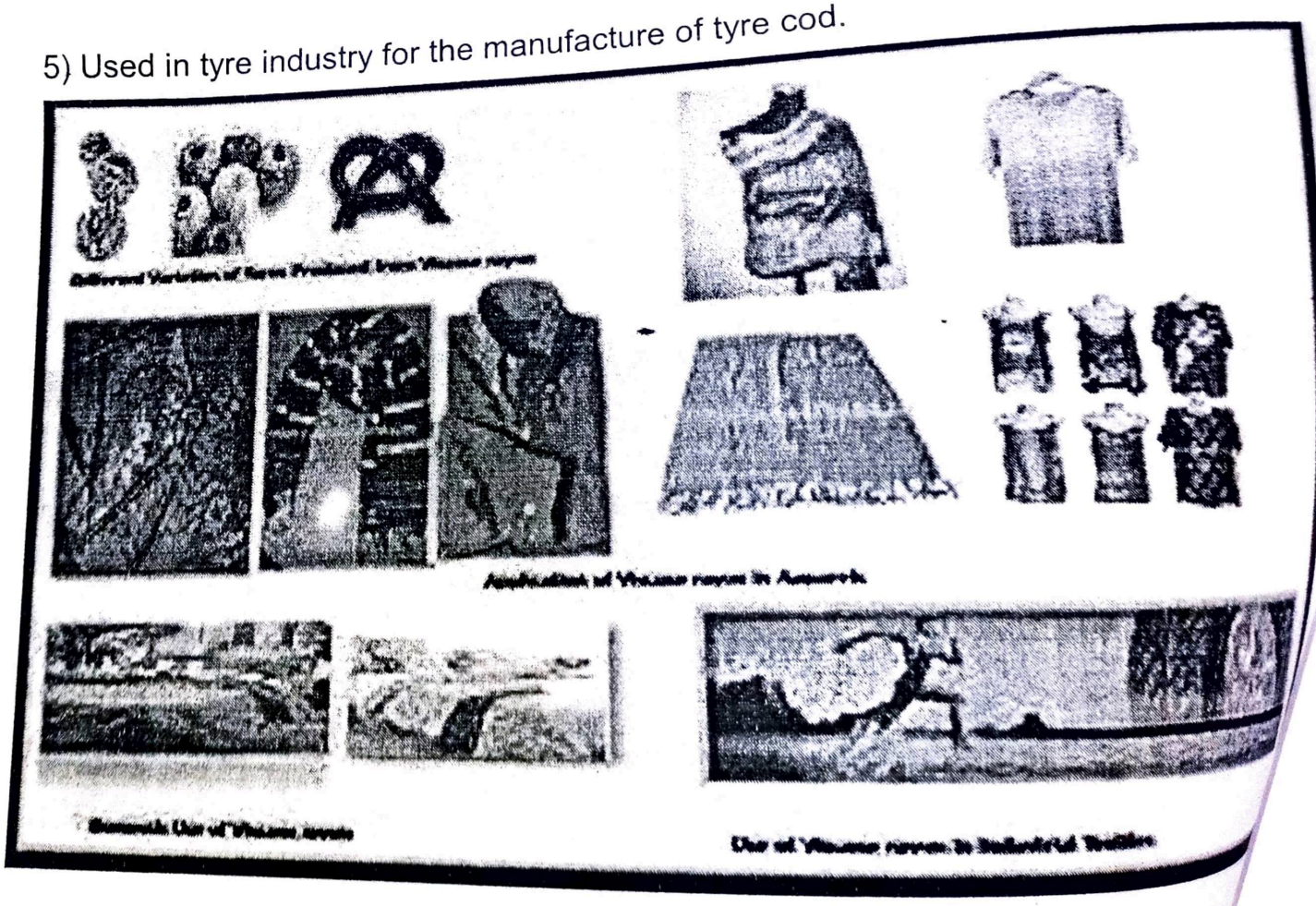
1) Rayon is used in textile industry for making clothing like sarees, blouses, dresses and socks.

2) Used to make bed-sheets, curtains, blankets, etc.

3) Used to make carpets.

4) Used in medical field for making bandages and surgical dressing.

5) Used in tyre industry for the manufacture of tyre cod.

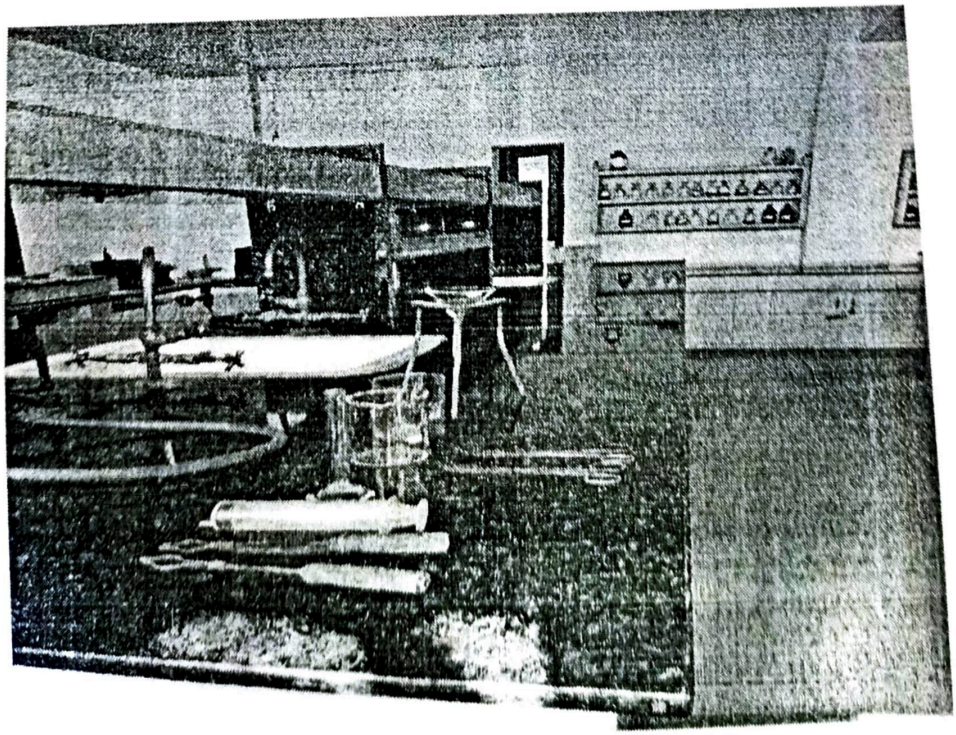


Apparatus Required

1. Conical flask (preferably 250 ml)
2. Funnel
3. Glass rod
4. Beaker (preferably 250 ml)
5. Water bath
6. Filter paper
7. Syringe

Chemicals Required

1. $CuSO_4$
2. NaOH solution
3. Liquor ammonia solution
4. Dilute H_2SO_4
5. Filter Paper
6. Distilled H_2O



Procedure

1. **Preparation of Schweitzer's Solution:**
2. Way20g of $CuSO_4.5H_2O$
3. Transfer this to a beaker having 100ml distilled water and add 15ml of dilute H_2SO_4 to prevent hydrolysis of $CuSO_4.5H_2O$.
4. Stir it with a glass rod till a clear solution is obtained. Add 11ml of liquor ammonia drop by drop with slow stirring. The precipitate of cupric hydroxide is separated out.
5. Filter the solution containing cupric hydroxide through a funnel with filter paper.
6. Wash the precipitate of cupric hydroxide with water until the filtrate fails to give a positive test for sulphate ions with barium chloride solution.
7. Transfer the precipitate to a beaker that contains 50ml of liquor ammonia or wash it down the funnel. The precipitate when dissolved in liquor ammonia gives a deep blue solution of tetra-ammine cupric hydroxide. This is known as SCHWEITZER'S SOLUTION.

8. **Preparation of Cellulose material**
9. After weighing 2g of filter paper divide it into very fine pieces and then transfer these pieces to the tetra-ammine cupric hydroxide solution in the beaker.
10. Seal the flask and keep for 10 to 15 days, during this period the filter paper is dissolved completely.

11. **Formation of Ravon Thread**
12. Take 50ml of distilled water in a glass container. To this add 20ml of conc. H_2SO_4 drop by drop. Cool the solution under tap water. In a big glass container pour some of the solution.
13. Fill the syringe with cellulose solution prepared before.
14. Place the big glass container containing H_2SO_4 solution produced before in ice (the reaction being spontaneous results in excess

release of energy in the form of heat which makes the fibers weak and breaks them).

15. Immerse the tip of the syringe in the solution and press gently. Notice the fibers getting formed in the acid bath. Continue to move your hand and keep pressing the syringe to extrude more fibers into the bath.
16. Leave the fibers in solution till they decolorize and become strong enough.
17. Filter and wash with distilled water.

Result:

Rayon thread was prepared from filter paper

Precautions

1. Addition of excess NH_3 should be avoided.
2. Before taking the viscose in the syringe make sure that it does not contain any particles of paper, otherwise, it would clog the needle of the syringe.
3. Addition of NH_3 should be done in a fume cupboard and with extreme care. The fumes if inhaled may cause giddiness.
4. Use a thick needle otherwise the fibers won't come out.

Extraction and isolation of DNA from different plant product

Bachelors of Bio-science

Session:-2019-2020

Supervisor:-

Mrs. Nirmal Malik

(Assistant professor)

Department of Bio-science

Adarsh Mahila mahavidyalay, Bhiwani

Submitted by:-

Himanshi, sapna

Content:-

INTRODUCTION

DNA usually occurs as linear chromosomes in eukaryotes, and circular chromosomes in prokaryotes. The set of chromosomes in a cell makes up its genome; the human genome has approximately 3 billion base pairs of DNA arranged into 46 chromosomes.[88] The information carried by DNA is held in the sequence of pieces of DNA called genes. Transmission of genetic information in genes is achieved via complementary base pairing. For example, in transcription, when a cell uses the information in a gene, the DNA sequence is copied into a complementary RNA sequence through the attraction between the DNA and the correct RNA nucleotides. Usually, this RNA copy is then used to make a matching protein sequence in a process called translation, which depends on the same interaction between RNA nucleotides. In alternative fashion, a cell may simply copy its genetic information in a process called DNA replication. The details of these functions are covered in other articles; here the focus is on the interactions between DNA and other molecules that mediate the function of the genome.

What is DNA?

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. Most DNA is located in the cell nucleus (where it is called nuclear DNA), but a small amount of DNA can also be found in the mitochondria (where it is called mitochondrial DNA or mtDNA)

The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T).

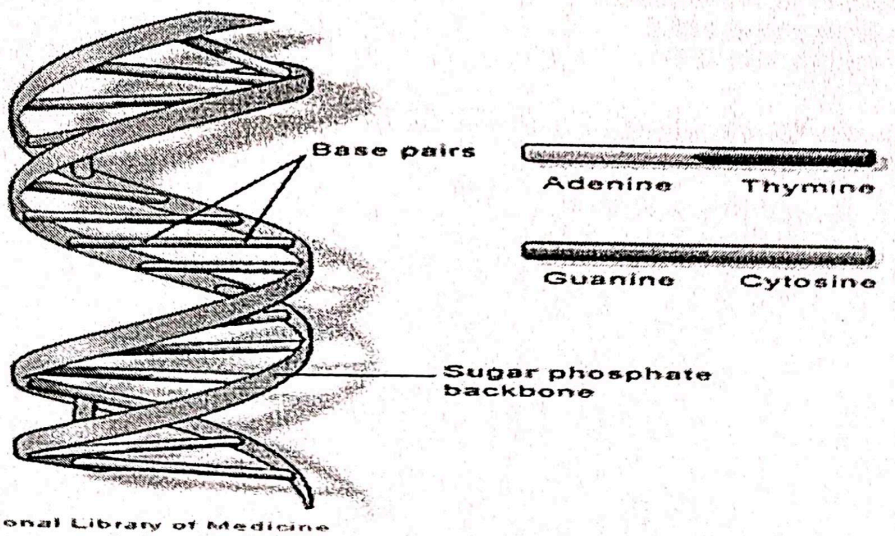
The order, or sequence, of these bases determines the information available for building and maintaining an organism, similar to the way in which letters of the alphabet appear in a certain order to form words and sentences.

Structure of DNA:-

Deoxyribonucleic acid (DNA) is a molecule composed of two polynucleotide chains that coil around each other to form a double helix carrying genetic instructions for the development, functioning, growth and reproduction of all known organisms and many viruses. DNA and ribonucleic acid (RNA) are nucleic acids. Alongside proteins, lipids and complex carbohydrates (polysaccharides), nucleic acids are one of the four major types of macromolecules that are essential for all known forms of life.

The two DNA strands are known as polynucleotides as they are composed of simpler monomeric units called nucleotides.[2][3] Each nucleotide is composed of one of four nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] or thymine [T]), a sugar called deoxyribose, and a phosphate group. The nucleotides are joined to one another in a chain by covalent bonds (known as the phospho-diester linkage) between the sugar of one nucleotide and the phosphate of the next, resulting in an alternating sugar-phosphate backbone. The nitrogenous bases of the two separate polynucleotide strands are bound together, according to base pairing rules (A with T and C with G), with hydrogen bonds to make double-stranded DNA. The complementary nitrogenous bases are divided into two groups, pyrimidines and purines. In DNA, the pyrimidines are thymine and cytosine; the purines are adenine and guanine.

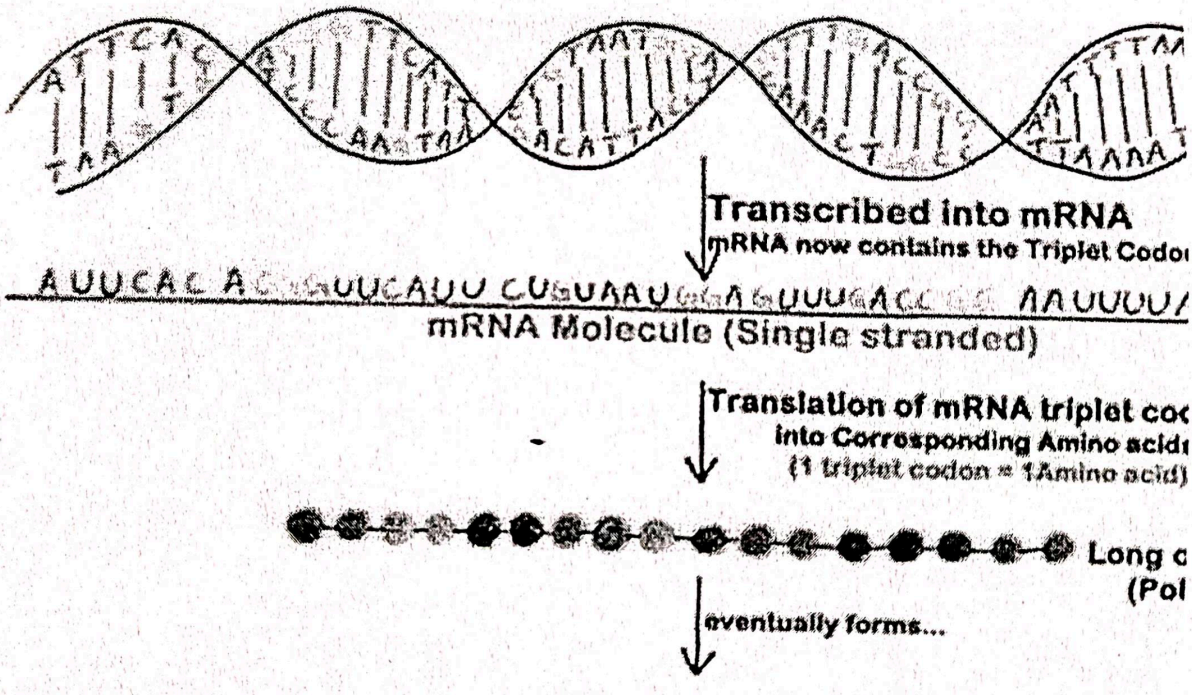
Both strands of double-stranded DNA store the same biological information. This information is replicated as and when the two strands separate. A large part of DNA (more than 98% for humans) is non-coding, meaning that these sections do not serve as patterns for protein sequences. The two strands of DNA run in opposite directions to each other and are thus antiparallel. Attached to each sugar is one of four types of nucleobases (or bases). It is the sequence of these four nucleobases along the backbone that encodes genetic information. RNA strands are created using DNA strands as a template in a process called transcription, where DNA bases are exchanged for their corresponding



U.S. National Library of Medicine

bases except in the case of thymine (T), for which RNA substitutes uracil (U).[4] Under the genetic code, these RNA strands specify the sequence of amino acids within proteins in a process called translation.

Within eukaryotic cells, DNA is organized into long structures called chromosomes. Before typical cell division, these chromosomes are duplicated in the process of DNA replication, providing a complete set of chromosomes for each daughter cell. Eukaryotic organisms (animals, plants, fungi and protists) store most of their DNA inside the cell nucleus as nuclear DNA, and some in the mitochondria as mitochondrial DNA or in chloroplasts as chloroplast DNA.[5] In contrast, prokaryotes (bacteria and archaea) store their DNA only in the cytoplasm, in circular chromosomes. Within eukaryotic chromosomes, chromatin proteins, such as histones, compact and organize DNA. These compacting structures guide the interactions between DNA and other proteins, helping control which parts of the DNA are transcribed.



What is DNA extraction and it's applications?

DNA extraction is the technique used to isolate DNA in a biological sample.

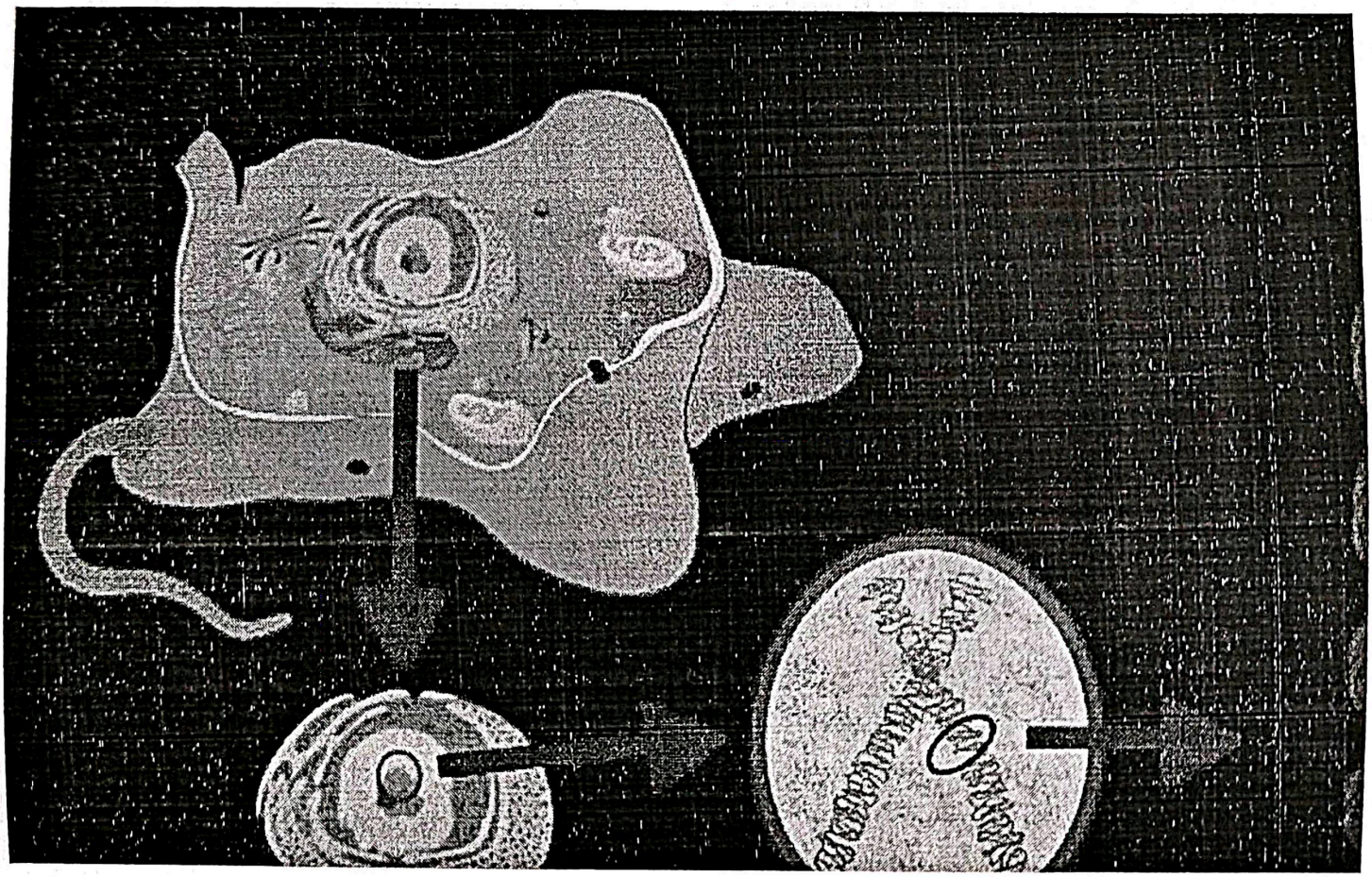
Importance:-

The extraction of DNA is pivotal to biotechnology. It is the starting point for numerous applications, ranging from fundamental research to routine diagnostic and therapeutic decision-making. Extraction and purification are also essential to determining the unique characteristics of DNA, including its size, shape and function.

Applications:-

The ability to extract DNA is of primary importance to studying the :-

- Genetic causes of disease.
- For the development of diagnostics and drugs.
- It is also essential for carrying out forensic science



What is difference between plant and animal DNA?

In the center of every plant cell, from algae to orchids – and in the center of every animal cell, from jellyfish to you and me – there's a copy of the organism's genetic material. This DNA carries a complete blueprint of the organism. It's what transfers characteristics from one generation to the next.

At the chemical level – the cells of all plants and all animals contain DNA in the same shape – the famous "double helix" that looks like a twisted ladder.

Soth plants and animals are made from the same four chemical building blocks called _nucleotides_ .

What is different is how these four nucleotides in DNA are arranged. It's their sequence that determines which proteins will be made. The way the nucleotides are arranged, and the information they encode, decides whether the organism will produce scales or leaves – legs or a stalk.

Research shows that plants and animals may produce some proteins in common. One prominent example is known as Cytochrome C. But because the DNA copying process is imperfect, mistakes accumulate over time, making Cytochrome C slightly different in different creatures. The gene regions that specify the amino acid sequence in human Cytochrome C are more similar to those in another mammal like a rabbit, and less similar to a more evolutionarily distant creature, like a sunflower.

Every species has a characteristic number of chromosomes, called the chromosome number. Animals have more chromosomes; plants have fewer.

Utility of DNA fingerprinting in plants:-

Simplifying the Search

DNA fingerprinting can be of use to plant breeders to simplify their work and reduce the amount of time it takes to produce crops with desirable new traits. For example, once a scientist isolates a specific gene that expresses a certain crop trait, a batch of seed is then produced which the scientist hopes carries the trait. At one time, the researcher would have to grow the crop to see if the trait is present. But now, the DNA of the seed batch can be tested to determine if the seeds contain the sought-after gene. The DNA test can also be used to identify and keep track of genes as they are isolated and transferred into crops. As well, it can become a tool to simplify the more traditional methods of selective breeding, by identifying what are known as "markers." Since DNA fingerprints are taken from the same DNA that carries the entire genetic blueprint for the plant, pieces of DNA that are close together tend to be passed on together from one generation to the next. If one particular band of a DNA fingerprint is found to be inherited along with a useful trait, that band serves as a marker for that trait. This marker shows which offspring may carry the trait, without having to search for the specific genetic material.

Genetic modified crops

Protecting plant breeders's rights (the breeders' patents on specific types of seed), is another use for the DNA test. Disputes over the true identify of seed varieties can be easily resolved, since the test will be able to isolate the specific traits that distinguish one seed variety from another. As well, new international rules are requiring crops which are genetically altered to be separated from ordinary crops. Crops may have specific genes inserted which, for example, make the plants resistant to a certain type of herbicide. This herbicides resistance reduces farmers' input costs by reducing the amount of chemical they use to control weeds.

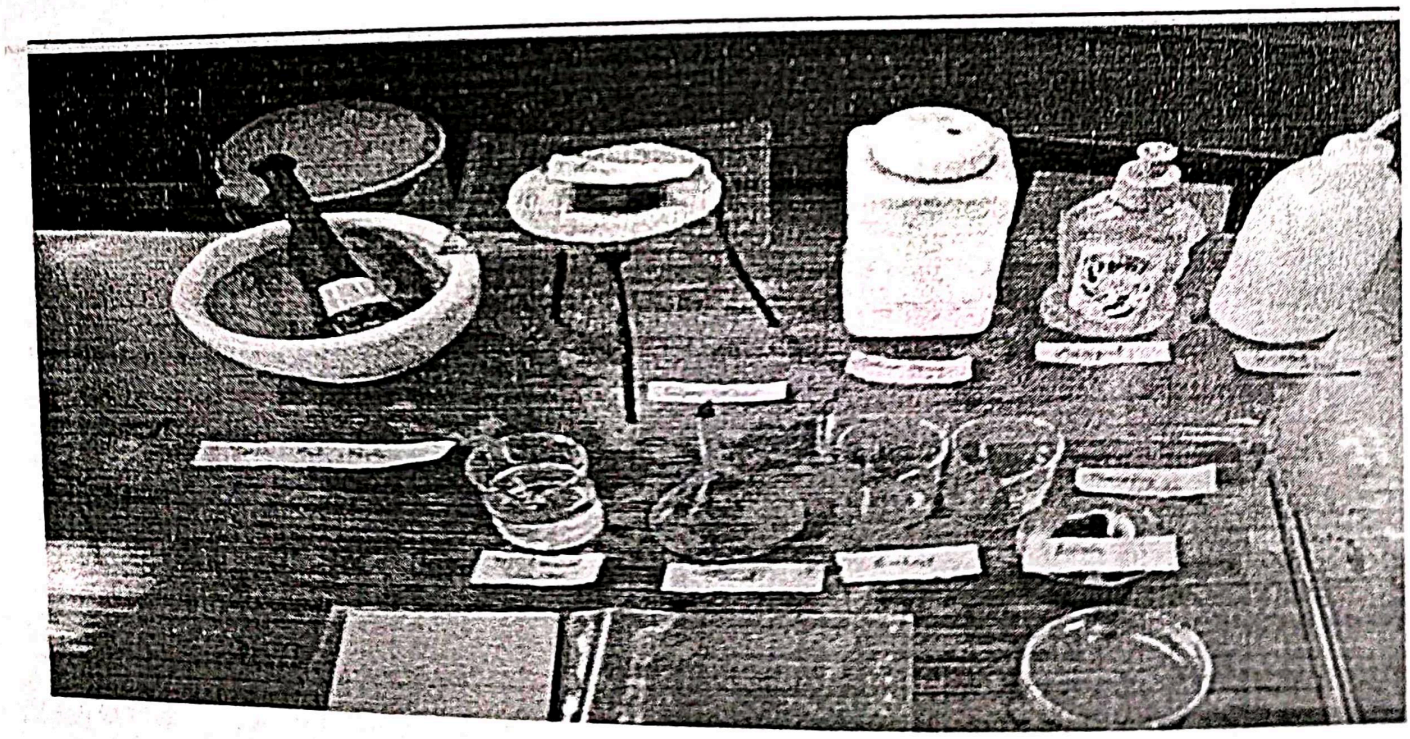
DNA fingerprinting may also be used in the future to identify disease infection in crops. Each disease-causing agent, such as a fungus, bacteria or virus, has a unique DNA fingerprint. If a DNA test indicated the presence of a disease organism, infection might be detected at an early stage, and a farmer could take appropriate preventive steps.

Building a Library

In order for the seed industry or others to effectively use DNA tests, both private and government labs are working on building a library of crop DNA profiles. As new samples are analyzed, a computer scan can produce matches between the samples and DNA profiles already recorded. These labs plan to offer the testing service at a reasonable cost. That means DNA testing will likely becomes as commonplace as other agricultural testing services, like soil sampling and seed germination testing.

Material:-

- onion, banana, papaya, spinach
- Funne
- Measuring cylinder
- Petri dish
- Sharp knife for cutting onion
- Poly bag
- Poly bag
- Spirit lamp
- Needle
- Ethanol 90%
- Large spoon for mixing
- Food processor or blender
- Thermometer
- Strainer or funnel
- Ice water bath
- Distilled wate
- Table salt(NaCl)
- Detergent
- Pestle mortar



Method:-

Lysis

In this step, the cell and the nucleus are broken open to release the DNA inside and there are two ways to do this. First, mechanical disruption breaks open the cells. This can be done with a tissue homogenizer (like a small blender), with a mortar and pestle, or by cutting the tissue into small pieces. Mechanical disruption is particularly important when using plant cells because they have a tough cell wall. Second, lysis uses detergents and enzymes such as Proteinase K to free the DNA and dissolve cellular proteins.

Precipitation

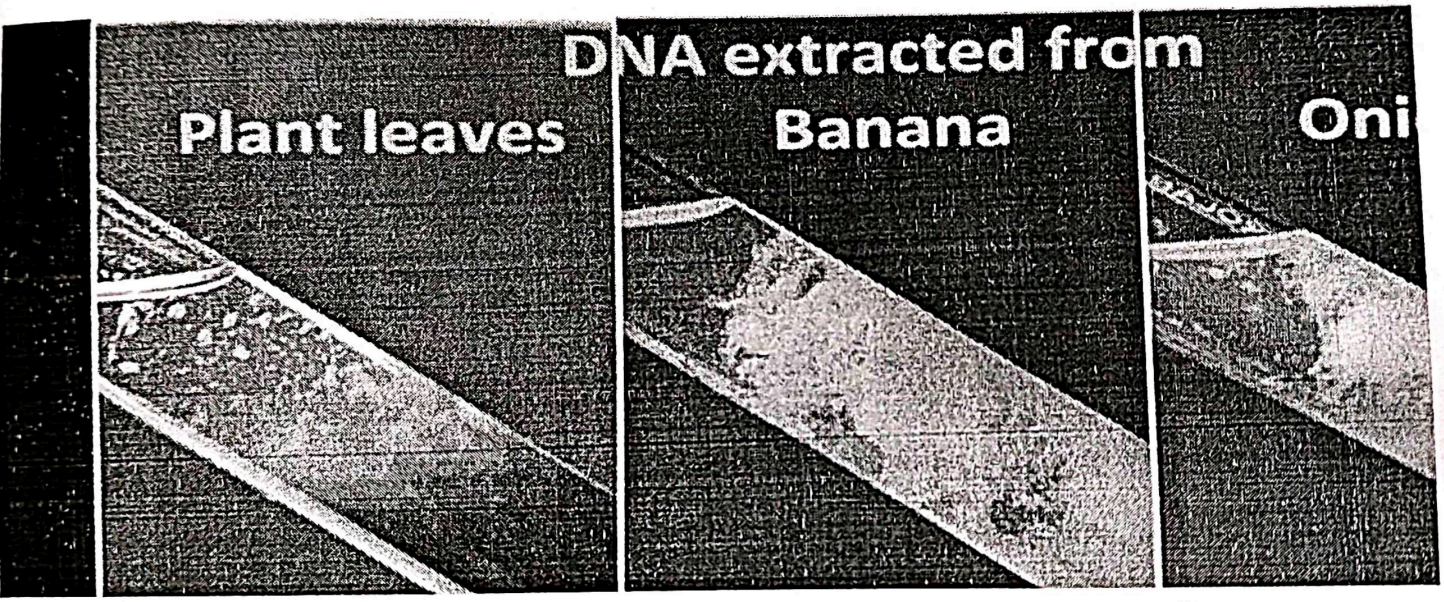
When you complete the lysis step, the DNA has been freed from the nucleus, but it is now mixed with mashed up cell parts. Precipitation separates DNA from this cellular debris. First, Na+ ions (sodium) neutralize the negative charges on the DNA molecules, which makes them more stable and less water soluble. Next, alcohol (such as ethanol or isopropanol) is added and causes the DNA to precipitate out of the aqueous solution because it is not soluble in alcohol.

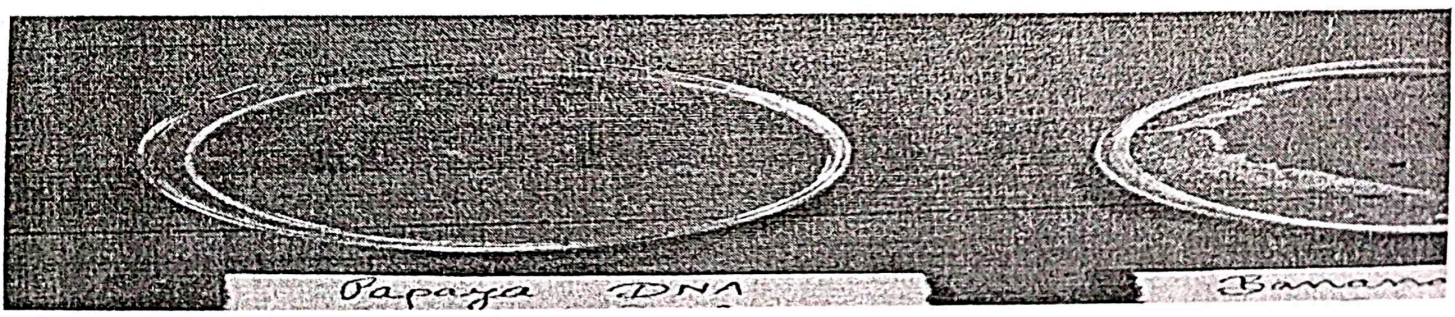
Purification

Now that DNA has been separated from the aqueous phase, it can be rinsed with alcohol to remove any remaining unwanted material and cellular debris. At this point the purified DNA is usually re-dissolved in water for easy handling and storage.

Result and conclusion:-

- The purpose of project was to extract the DNA from different plant product
- Detergent molecule dissolve the cell membrane of the plant cell by interacting with the lipid particles in the cell cell membrane .This expose the DNA.
- The dna will appear white and will form a clump made of string like strand that wrap on to the glass rod
- The ability to extract DNA is of primary importance to studying the genetic cause of disease and for development of diagnostic and drugs.





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Projects done in session 2020-2021:

S.No.	Name of the start up	Department	Year
1	Green Synthesis of silver nano particles using Azadirachta Indica (Neem) leaf extract	Chemistry	2020-2021
2			

Principal
Adarsh Mahila Mahavidyalaya
Bhiwani

Green synthesis of silver nanoparticles using *Azadirachta indica* (Neem) aqueous leaf extract

Bachelors of Science

(Session: 2020-2021)

Adrash Mahilamahavidyalay, Bhiwani

Submitted by:-

Parul

B.Sc (Non Medical)

Roll No-2622

Sarika

B.Sc (Non Medical)

Roll No-2605

Supervisor:-

Mrs. Rachna Arora

(Head of department)

Department of Chemistry

Mrs. Vidushi

(Assistant professor)

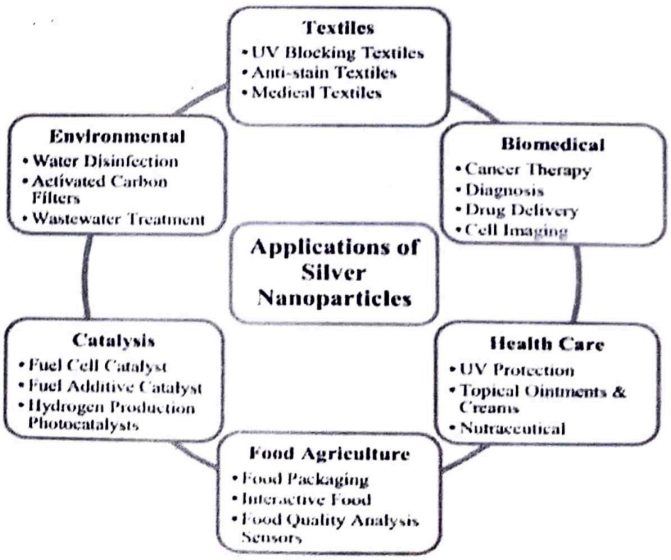
Department of Chemistry

Dr. Ritika Choudhary

(Assistant professor)

Department of Chemistry

Content:-



1. Abstract

Eco friendly and cost effective methods of green mediated synthesis of nanoparticles are the present research in the limb of nanotechnology. The present work leads to the synthesis of silver nanoparticles from 1 mM $AgNO_3$ solution through various concentration of aqueous leaf extract of Azadirachta indica reducing as well as capping agent. Results confirmed this protocol as simple, rapid, one step, eco-friendly, non-toxic and an alternative conventional physical / chemical method. Only 15 min were required for the conversion of silver ions into silver nanoparticles at room temperature, without the involvement of any hazardous chemical.

Based on the result obtained it can be said that the plant resources can efficiently use in the production of silver nanoparticle and it could be utilized in various fields in biomedical and nanotechnology.

Keywords:

Green synthesis, Silver nanoparticle, *Azadirachta indica, Bioreduction'Plant* extracts

2. Introduction

The 'green' environment friendly processes in chemistry and chemical technologies are becoming increasingly popular and are much needed as a result of worldwide problems associated with environmental concerns (Thuesombat, Hannongbua, Akasit, & Chadchawan, 2014). Silver is the one of the most commercialized nano-material with five hundred tons of silver nanoparticles production per year (Larue et al., 2014) and is estimated to increase in next few years. Including its profound role in field of high sensitivity biomolecular detection, catalysis, biosensors and medicine; it is been acknowledged to have strong inhibitory and bactericidal effects along with the anti-fungal, anti-inflammatory and anti-angiogenesis activities

Several methods have been used for the preparation of silver nano-particles which can be either physical, chemical or biological methods. Earlier methods used for the synthesis of silver nano-particles were toxic and hazardous chemicals were used for their synthesis. Thus the use of eco-friendly processes, for the synthesis of silver nano-particles is known as "Green synthesis". Green synthesis is preferred over conventional synthesis because it is eco-friendly, cost-effective, single-step method that can be easily scaled up for large scale synthesis and does not require high pressure, temperature, energy and toxic chemicals. Many researchers have reported the use of materials such as plant leaf extract, root, stem, bark, leaf, fruit, bud and latex (Mariselvam et al. 2014), fungi (Bhainsa 2006), bacteria (Saifuddin et al. 2009) and enzymes (Willner et al. 2007) for the synthesis of silver nano-particles. A lot of work has been

done on green synthesis of silver nano-particles using microorganisms including bacteria, fungi and plants because of their antioxidant properties capable of reducing metal compounds in their respective nanoparticle. Plant extracts produce best capping material for the stabilization of silver nanoparticles.

Considering the vast potentiality of plants as sources this work aims to apply a biological green technique for the synthesis of silver nanoparticles as an alternative to conventional methods. In this regard, leaves extract of *Azadirachta indica* (commonly known as neem) a species of family Meliaceae was used for *bioconversion* of silver ions to nanoparticles. This plant is commonly available in India and each part of this tree has been used as a household remedy against various human ailments from antiquity and for treatment against viral, bacterial and fungal infections . Silver nanoparticles can be produced at low concentration of leaf extract without using any additional harmful chemical/physical methods. The effect of concentration of metal ions and concentration of leaf extract quantity were also evaluated to optimize route to synthesis silver nanoparticle. The method applied here is simple, cost effective, easy to perform and sustainable.

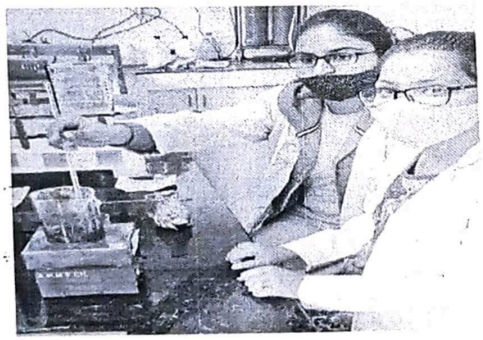
3. Material

Apparatus used- Beaker, conical flask, magnetic stirrer, magnetic bead, burette etc.

Chemical used- Silver nitrate, distilled water, leaf of neem plant etc.

4. Experiment

Typically, a plant extract-mediated bioreduction involves mixing the aqueous extract with an aqueous solution of the appropriate metal salt. The synthesis of nanoparticle occurs at room temperature and completes within a few minutes.



Preparation of plant extract

A. indica leaf extract was used to prepare silver nanoparticles on the basis of cost effectiveness, ease of availability and its medicinal property. Fresh leaves were collected from college campus

in month of February. They were surface cleaned with running tap water to remove debris and other contaminated organic contents, followed by double distilled water and air dried at room temperature. About 20 gm of finely cut leaves were kept in a beaker containing 200 ml double distilled water and boiled for 30 min. The extract was cooled down and filtered with Whatman filter paper no.1 and extract was stored at 4 °C for further use.

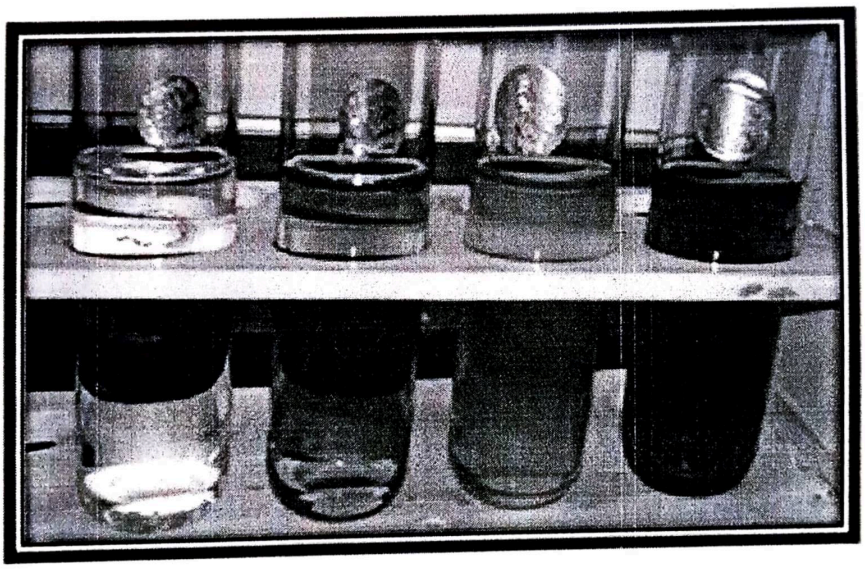
Green synthesis of silver nanoparticles

Silver nitrate GR used as such (purchased from Merck, India). 100 ml, 1 mM solution of silver nitrate was prepared in an Erlenmeyer flask. Then 1, 2, 3, 4 and 5 ml of plant extract was added separately to 10 ml of silver nitrate solution keeping its concentration at 1 mM. Silver nanoparticles were also synthesized by varying concentration of $AgNO_3$ (1 mM–5 mM) keeping extract concentration constant (1 ml). This setup was incubated in a dark chamber to minimize photo-activation of silver nitrate at room temperature. Reduction of Ag^+ to Ag^0 was confirmed by the colour change of solution from colourless to brown. Its formation can also be confirmed by using UV–Visible spectroscopy.

(Fig-1)

5. Result

In all experiments, addition of plant extract of *A. indica* into the beakers containing aqueous solution of silver nitrate led to the change in the colour of the solution to yellowish to reddish brown (shown in Fig. 3) within reaction duration due to excitation of surface Plasmon vibrations in silver nanoparticles . On addition of different concentration (1–5 ml) of leaf extracts to aqueous silver nitrate solution keeping its concentration 10 ml (1 mM) constant, the colour of the solution changed from faint light to yellowish brown and finally to colloidal brown indicating formation of silver nanoparticles. Different parameters were optimized including concentration of silver nitrate and *A. indica* leaf extract, and time which had been identified as factors affecting the yields of silver nanoparticle

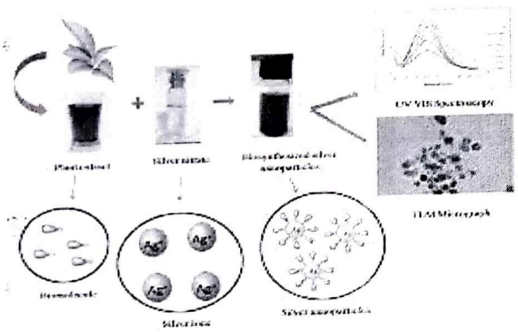


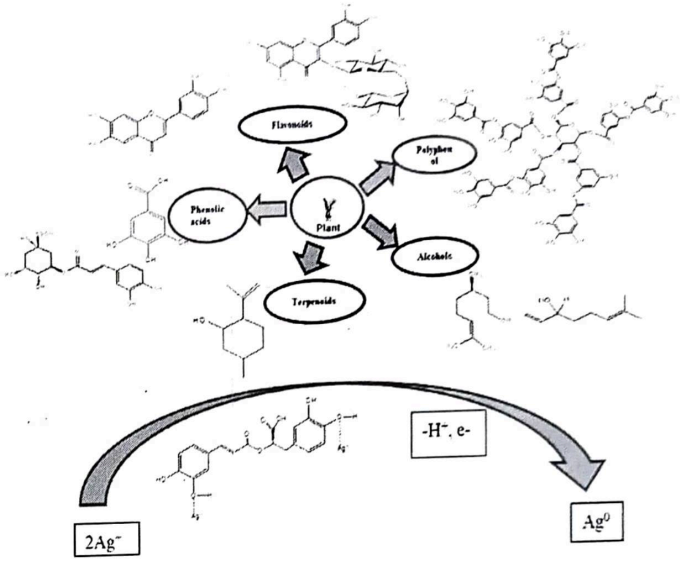
(Fig. 3)

Parallel changes in colour have been observed when different concentrations (1 mM–5 mM) of silver nitrate was used by keeping plant extract (1 ml) constant. The appearance of the brown colour was due to the excitation of the Surface Plasmon Resonance (SPR), typical of silver nanoparticles having absorbance values which were reported earlier in the visible range of 446–448 nm (Banerjee et al., 2014, Tripathy et al., 2010). There is increase in intensity of absorption peaks after regular intervals of time and the colour intensity increased with the duration of incubation.

6. Discussion

After the addition of Neem leaf extract to $AgNO_3$ solution a visible color change from transparent to dark brown was observed which indicates the formation of silver nanoparticle. This occurred due to the reduction of silver ions present in the solution due to terpeniods present in neem leaf extract. After 90 minutes there was no change in the intensity of color developed, which indicates the completion of reduction reaction. The reduced silver particles are in the range of nano size.





7. Conclusion

The neem leaf extract was prepared from fresh neem leaves by boiling it for 3 minutes, 5 minutes and 10 minutes separately. The obtained extract was of greenish color. Freshly prepared leaf extract was added to 1mM silver nitrate solution and the reaction takes place at room temperature which resulted in the synthesis of silver nanoparticles. It has been demonstrated that Neem leaf extract is capable of producing silver nanoparticles that shows good stability in solution. This green synthesis method is alternative to chemical method, since it is cheap, pollutant free and eco-friendly. The results showed that neem plays an important role in the reduction and stabilization of silver to silver nanoparticles. Benefits of using plant extract for synthesis is that it is energy efficient, cost effective, protecting human health and environment leading to lesser waste and safer products. This eco-friendly method could be a competitive alternative to the conventional physical/chemical methods used for synthesis of silver nanoparticle and thus has a potential to use in biomedical applications and will play an important role in opto-electronics and medical devices in near future.

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Intellectual Property Right Cell

IPR Cell is committed to encourage, protect, manage and commercialize Intellectual Property such as Patent, Copyright, Trademark ect. through seminars, workshop and activities. The cell creates conducive environment in the academics for the development of Intellectual property.

Vision

To promote better understanding of IPR and to identify more IPs.

Mission

To make students aware about intellectual property rights.

Objectives

- To aware and educate the faculty and students
- about IPR.
- To advice and guide faculty and students on the importance of IPR.
- To conduct workshops, activities and training programs regarding IPR.
- To provide guidelines on applicable laws and regulations regarding IPR.

Principal
Adarsh Mahila Mahavidyalaya
Bhiwani

Events and activities focused during the session 2022-2023-

ONE DAY SEMINAR ON INTELLECTUAL PROPERTY RIGHTS

IPR Cell organized a One Day Seminar on Intellectual Property Rights on 22nd November, 2022 under the guidance of MsRachna Arora, Principal, AMMB. The Keynote Speaker was Ms. Namita Verma. She explained about the various aspects of Intellectual Property Rights. She also talked about how one can use the IPR. She also cleared the doubts of faculty members and students regarding the laws of IPR. She explained the implementation of IPR laws in various cases. 40 teachers and 80 students attended this workshop.

Principal
Adarsh Mahila Mahavidyalaya
Bhiwani

ADARSH MAHILA MAHAVIDYALAYA
BHIWANI

IPR CELL

Organises

ONE DAY SEMINAR

on

"Intellectual Property Rights"

by

Ms. Namita Verma

Assistant Professor of Law Department

(Keynote Speaker)

Date : 22 Nov. 2022 Time : 12:00 Noon Venue : College Auditorium

Principal
Dr. Rachna Arora

Convener
Neeki

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