

One-Day Seminar
on

Organic Molecules and Their Chemistry with Metals



Organised By
Department of Chemistry
and

I.Q.A.C. of Polba Mahavidyalaya
Polba, Hooghly, W.B., PIN-712148

To
The Teacher-in-Charge
Polba Mahavidyalaya
Polba, Hooghly
Pin- 712148

Sub: Seeking permission to organize a One-Day Seminar on "Organic Molecules and Their Chemistry with Metals" on 21.03.2023

Sir,

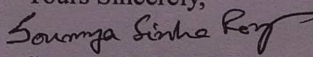
With due respect, I, on behalf of Department of Chemistry, Polba Mahavidyalaya, would like to request your kind permission to organize a one-day seminar on "Organic Molecules and their Chemistry with Metals" in the college premises. The proposed date of the said seminar is tentatively on 21.03.2023 and will be finalized according to the convenience of the Resource person.

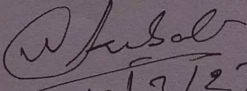
- Proposed Resource Person :
 1. Dr. Soumava Biswas, Former Post-Doctoral Researcher, Brno University of Technology, Central European Institute of Technology, Czech Republic.
Topic: Metal-organic frameworks for gas storage and proton conduction
- Proposed Budget:
 - Resource Person Honorarium: Rs. 1000/-

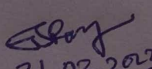
Hope you would be kind enough to provide your administrative and financial permission for the forthcoming Seminar.

Thanks and Regards,

Date: 10/03/23
Place: Polba, Hooghly.

Yours Sincerely,

Soumya Sinha Roy
State Aided College Teacher
Department of Chemistry
Polba Mahavidyalaya

Allowed

10/3/23.


31.03.2023

Telephone: (03213) 225128, 225133
Fax : (03213) 225128

web site: polbamahavidyalaya.com
e-mail: officepolbamahavidyalaya@gmail.com



POLBA MAHAVIDYALAYA

Post Office - Polba, District – Hooghly, West Bengal, Pin - 712148
AFFILIATED TO THE UNIVERSITY OF BURDWAN
Recognized under Sections 2(f) & 12(B) of the UGC Act. 1956
NAAC Accredited

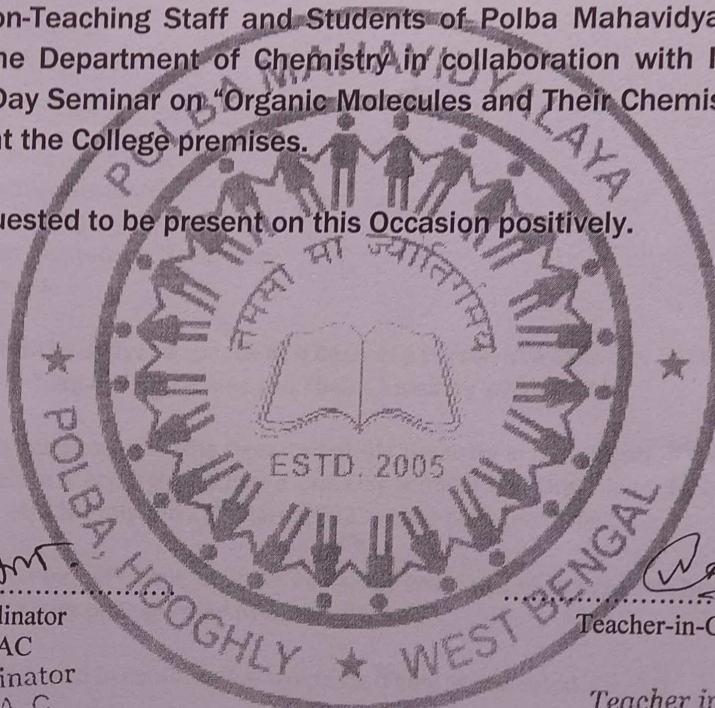
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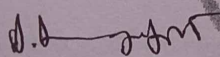
Date - 10/03/2023

Notice

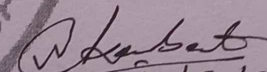
All Teaching, Non-Teaching Staff and Students of Polba Mahavidyalaya are hereby informed that the Department of Chemistry in collaboration with IQAC is going to organize a One-Day Seminar on "Organic Molecules and Their Chemistry with Metals" on 21.03.2023 at the College premises.

All are requested to be present on this Occasion positively.






Coordinator
IQAC
Coordinator
I. O. A. C.
Polba Mahavidyalaya
Polba, Hooghly
West Bengal



Teacher-in-Charge

Teacher in Charge
Polba Mahavidyalaya
Polba, Hooghly, West Bengal




31.03.2023



POLBA MAHAVIDYALAYA
(AFFILIATED TO THE UNIVERSITY OF BURDWAN)
Polba, Hooghly, Pin-712148

To
Dr. Soumava Biswas
Former Post-doctoral Researcher
Brno University of Technology
Central European Institute of Technology
Brno, Czech Republic

**Sub: Invitation to deliver a speech as a Resource Person in a One-Day Seminar on
"Organic Molecules and Their Chemistry with Metals"**

Sir,

We feel happy to announce that the Department of Chemistry in collaboration with IQAC, Polba Mahavidyalaya is going to organize a One-Day Seminar on "Organic Molecules and Their Chemistry with Metals" on 21st March, 2023 at the college premises.

On this occasion, on behalf of our Institute, I cordially invite you to deliver one-hour lecture from 12.30 pm as a very distinguished Resource Person.

Intimation from your end in confirmation would be highly appreciated.

Thanking you,

With Regards,

W Kaibarta
10/3/23.

Mr. Narugopal Kaibarta
Teacher-in-Charge
Polba Mahavidyalaya
Polba, Hooghly, West Bengal
Pin- 712148



Blair
31.03.2023

Objectives of the Seminar

Organic molecules are large class of molecules in which one or more atoms of carbon are covalently linked to atoms of other elements, most commonly hydrogen, oxygen or nitrogen. The study of organic molecules covers a vast area of chemistry. Now the interaction between organic molecules and metals opens a new domain of chemical science. This area deals with metal-organic complexes composed of organic ligands and metals, without any metal-carbon bond. It also deals with the organo-metallic compounds which have metal carbon bond in their structure. These complexes represent powerful building blocks for advanced materials with the applications in chemistry, catalysis, electronics, photonics, spintronics, solar cells, medicines and many others.

For example, metal organics frameworks (MOFs), where a three dimensional network of metal ions are held in place by multidentate organic molecules, are used in many applications including gas storage, gas purification and separation applications as well as heterogeneous catalysis. Metal nanoparticles prepared by green synthesis have wide applications in the field of medicinal and industrial chemistry. On the other hand, organometallic compounds are widely used in the fields of catalysis, pharmaceuticals, pesticides etc.

Despite the paramount number of scientific publications and discoveries in the field, the challenges in the design of those compounds still exist at both molecular and supra-molecular level.

In our undergraduate course we have the organic chemistry syllabus covering organic molecules with different functional groups. The syntheses of the molecules using different complexes and metals are included. The reactions of the organic compounds with different metals are also present in the syllabus.

Therefore the discussion on the topic "**Organic molecules and their chemistry with metals**" will enlighten the audience about the applications in this field in recent time. If we consider our students, the discussion should help to grow interest in those areas of the study and they may contribute their best to this research area in future.

ESB
31.03.2023

Programme of the Seminar

One-day Seminar

On

“ORGANIC MOLECULES AND THEIR CHEMISTRY WITH METALS”

Organized by

Department of Chemistry & I.Q.A.C.

POLBA MAHAVIDYALAYA

Tuesday, 21st March, 2023

Venue: Polba Mahavidyalaya (Room No. 202), Polba, Hooghly, W.B.-712148.

- **Registration:** 10:30 a.m. – 11:15 a.m.

- **Inaugural Session:** 11:15 a.m. – 12:00 p.m.
 - Objectives of the Seminar: Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya, Convenor.
 - Lighting of Lamp
 - Felicitations of Hon'ble T.I.C. Polba Mahavidyalaya, Distinguished Resource Person & Respected Madam, Dr. Sharmistha Gupta(Dutta), Associate Professor & H.O.D., Dept. of Philosophy by the students
 - Inaugural Speech by Hon'ble T.I.C., Polba Mahavidyalaya, Mr. N. G. Kaibartya, Associate Professor & H.O.D., Dept. of History, Polba Mahavidyalaya.

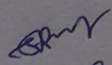
- **Technical Session- I:** 12:00 p.m. – 1:45 p.m.
 - Introduction of the Speaker: Dr. Amrita Das, Assistant Professor & H.O.D., Dept. of Mathematics, Polba Mahavidyalaya.
 - **Speech: “Metal-organic Frameworks for Gas Storage and Proton Conduction”** by Dr. Soumava Biswas, Former Postdoctoral Researcher, Central European Institute of Technology, Brno, Czech Republic.
 - Discussion

- **Lunch Break** 1:45 pm – 2.15 p.m.

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- **Technical Session- II:** **2:15 p.m. – 4.00 p.m.**
 - **Speech I :** 2:15 p.m. – 3.00 p.m.
“Green Synthesis of Silver Nanoparticles – A Review” by Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya.
 - **Presentation I :** 3.00 p.m. – 3:15 p.m.
“The Grignard Reagents” by Ms. Keya Das, Student, Semester-III, Department of Chemistry, Polba Mahavidyalaya.
 - **Presentation II :** 3:15 pm – 3:30 p.m.
“Alkanes, Alkenes & Alkynes” by Ms. Isha Das, Student, Semester-III, Department of Chemistry, Polba Mahavidyalaya.
 - Discussion

- **Valedictory Session:** **4.00 p.m. – 4:30 p.m.**
 - Vote of Thanks: Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya.
 - Closing the Programme: Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya.


31.03.2023

Progress Report of the Seminar

A One-day Seminar was organized by the Department of Chemistry & I.Q.A.C. of Polba Mahavidyalaya, Polba, Hooghly, W.B.-712148 at Room No. 202 of the college on 21st March, 2023. The topic of discussion of the seminar was “**Organic Molecules and Their Chemistry with Metals**”.

We started the Registration around 10:30 a.m. followed by the Inaugural Session around 11:15 a.m. The Objectives of the Seminar was briefly stated by Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya. Then the programme was carried forward by completing Lighting the Lamp ceremony. Felicitations of honourable T.I.C., Sri Narugopal Kaibarta, Distinguished Resource Person, Dr. Soumava Biswas & Dr. Sharmistha Gupta Dutta, Associate Professor & H.O.D., Dept. of Philosophy were done by the students. Next, the Inaugural speech was delivered by our respected T.I.C. Sir of Polba Mahavidyalaya.

After that we started our Technical Session: I introducing the Resource person, Dr. Soumava Biswas, Former Postdoctoral Researcher, Brno University of Technology, Central European Institute of Technology, Brno, Czech Republic by Dr. Amrita Das, Assistant Professor & H.O.D., Dept. of Mathematics, Polba Mahavidyalaya. Dr. Biswas delivered his speech on “**Metal-organic Frameworks for Gas Storage and Proton Conduction**”. The interaction between organic ligands and metals to form metal-organic frameworks(MOFs) and the practical applications of the MOFs was his main subject of discussion. The audience were highly enriched by his valuable discussion. Next a small Interaction Session of the speaker with the audience was done.

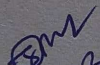
After the lunch break, we moved to the next part, Technical Session: II, around 2:15 p.m. Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry, Polba Mahavidyalaya gave a talk on “**Green Synthesis of Silver Nanoparticles – A Review**”. Current progress in the field of Synthesis of Silver Nanoparticles with their huge applications was the main focus of the speech.

After that Ms. Keya Das, a student of Semester-III, Department of Chemistry, Polba Mahavidyalaya gave a brief presentation on “**The Grignard Reagents**”. Following this, another presentation on “**Alkanes, Alkenes & Alkynes**” was given by Ms. Isha Das, Student,

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Semester-III, Department of Chemistry, Polba Mahavidyalaya. Next a short discussion was done with the audience.

Then we moved to the Valedictory Session. Mr. Soumya Sinha Roy, S.A.C.T., Department of Chemistry addressed Vote of Thanks to the Honourable Resource Person, Dr. Soumava Biswas, Respected T.I.C. of Polba Mahavidyalaya, I.Q.A.C. Coordinator, Dr. Santanu Sengupta, (Assistant Professor, Dept. of History), Honourable Bursar, Dr. Sanjay Kumar Ghosh (Associate Professor & H.O.D., Dept. of Bengali), Teacher Council Secretary, Dr. Kaliprasad Mishra (Associate Professor & H.O.D., Sanskrit), Convenor of Seminar Committee, Dr. Sohini Ghosh (Assistant Professor & H.O.D., Dept. of Education), all the respected faculty members & non-teaching staffs of our college and our beloved students. Following that we finally closed our programme.


31.03.23

A One-Day Seminar on "Organic Molecules and their Chemistry with Metals"

Department of Chemistry

POLBA MAHAVIDYALAYA

POLBA, HOOGHLY, W.B., PIN-712148

Date: 21.03.2023

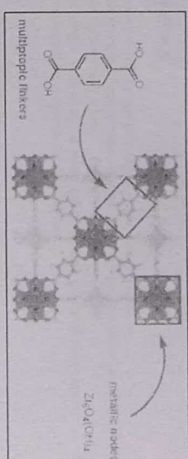
Sl. No.	Name of the Student	Semester with Roll No.	Signature of the Student
1	Bahmi Chatterjee	1 st Semester 701	Bahmi Chatterjee
2	Tina Ghosh	1 st Semester - 703	Tina Ghosh
3	Pranvita Ganguly	5 th Sem. - 201	Pranvita Ganguly
4	Kanya Khatoon	Sem-1-1708	Kanya Khatoon
5	Sakina Khatoon	Sem-1-1712	Sakina Khatoon
6	Surojit Tudu	Sem-III - 303	Surojit Tudu
7.	Sandip Das	Sem-III - 304	Sandip Das
8.	Supriya Sarmen	Sem-1-22	Supriya Sarmen
9.	Rupza Ghosh	Sem-1-1721	Rupza Ghosh
10.	Masuma Khatoon	Sem-1-1707	Masuma Khatoon
11.	Shilpi Das	Sem-1-1714	Shilpi Das
12.	Debi Chakrabarty	Sem-5-1013	Debi Chakrabarty
13.	Laboni Roy	Sem-5-1015	Laboni Roy
14.	Babita Ghosh	Sem-5 th -1053	Babita Ghosh
15.	Tiha Das	Sem-5-851	Tiha Das
16.	Upal Panja	Sem-1-806	Upal Panja
17.	Piu Roy	Sem-1-2	P.R
18.	Sangita Das	Sem-1-1	S.D
19.	Prince Sarkar	Sem-1-1609	P
20.	Manojit Manna	Sem-1-1927	M.M
21.	Sandip Das	Sem-1-1037	Sandip Das
22.	Madhumita Saha	Sem-1-604	Madhumita Saha
23.	Renu Sharma	Sem-1 st -10	Renu Sharma
24.	Subha Santra	Sem-1 st -405	Subha Santra
25.	Rupza Kanthali	Sem-1 st -406	Rupza Kanthali
26.	Sanchita Pauldas	Sem-1 st -4509	Sanchita Pauldas
27.	Hasinara Khatoon	Sem-1 st -1519	Hasinara Khatoon
28.	Hisa Muskan	Sem-1 st -1520	Hisa Muskan
29.	Afrin Khatoon	Sem-3 rd -104	Afrin Khatoon
30.	Sangita Kisku	Sem-1 st -1603	Sangita Kisku
31.	Rimpa Das	Sem-1 st -308	Rimpa Das
32.	Riyali Roy	Sem-1 st -303	Riyali Roy

21/03/23

Metal organic frameworks for gas storage and proton conduction

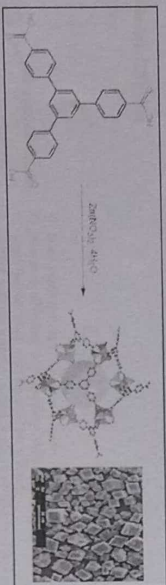
Dr. Soumya Biswas

Metal organic frameworks



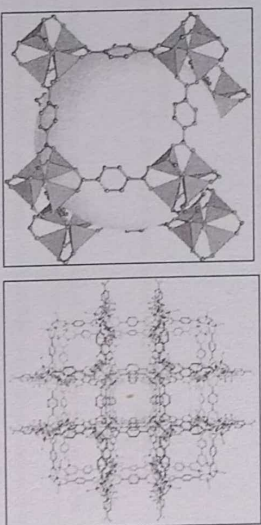
Zhou H.-C., Long J. R., Yaghi, O. M. *Chem. Rev.* 2012, 112, 673-674

Metal organic frameworks



Chen, H. K., Sempere, J. Y., Kim, J., Gu, Y., Edzards, M., Metzger, A. J., O'Keefe, M., Yaghi, O. M. *Nature* 2004, 427, 233-237

Metal organic frameworks



Roth N. L., Eckert, J., Edzards, M., Vada, D. T., Kim, J., O'Keefe, M., Yaghi, O. M. *Science* 2002, 298, 1127-1130

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Metal organic frameworks

Syntheses

Conventional approach:

1. Solvothermal synthesis
2. Slow solvent diffusion

Other approach:

1. Microwave-assisted synthesis
2. Sonochemical synthesis
3. Electrochemical synthesis
4. Mechanochemical synthesis

N. Stock, S. Bawiec *Chem. Rev.* 2012, 112, 933

5

Metal organic frameworks

Solvothermal synthesis

- This involves heating of the reactant in a closed vessel, called autoclave
- The autoclave is constructed from stainless steel to withstand the high pressure and is fitted with a safety wall. It may be lined with teflon.
- At the reaction condition, the pressure is raised above the atmospheric pressure and the temperature above the boiling temperature of the solvent.

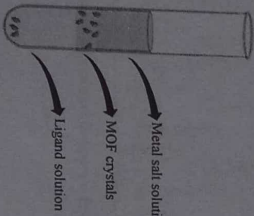
Autoclave Reactor



6

Metal organic frameworks

Slow solvent diffusion



- Main purpose to slow down the reaction
- Reactions take place on the solution interface
- Good for very dilute solution (milligram scale)
- Solvent with more density should be placed on bottom of the tube
- Good quality crystal

7

Hydrogen storage in MOFs

- Why?
- Decrease in petroleum dependence
- Hydrogen as energy carrier → clean, efficient, and can be derived from domestic resources

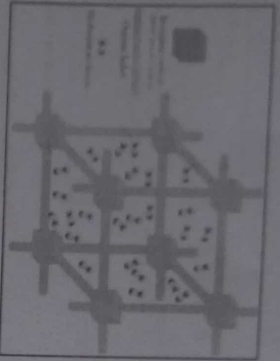
Key points:

- Hydrogen storage is a critical enabling technology for the acceptance of hydrogen powered vehicles
- Storing sufficient hydrogen on board to meet consumers requirements (eg. driving range, cost, safety, and performance) is a crucial technical parameter
- The US Department of Energy (DOE) sets the target to focus on R&D and to stimulate research on hydrogen storage.
- For the year 2020 DOE has set the performance target of 4.5 wt% of usable hydrogen storage capacity at 233-358 K and 5-12 bars. The ultimate target of 6.5 wt% is set by DOE.

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RW
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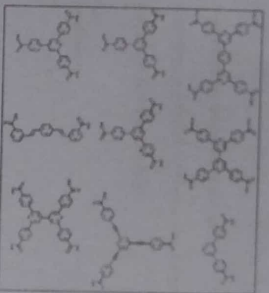
Hydrogen storage in MOFs



Scheme 1. Representation of the interaction of H₂ with surface of the ligands in MOFs voids

9

Hydrogen storage in MOFs



Scheme 2. Representation of some ligands for MOF synthesis

10

Hydrogen storage in MOFs



Figure 1. View of three dimensional framework

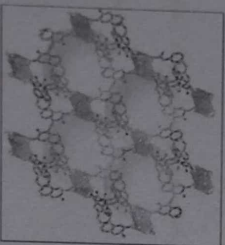


Figure 2. Representation of void

Ilsema, S.; Jena, H. S.; Gnanasekaran, S.; Sanku, S.; Kumar, S. *Cryal Growth Des* 2014, 4, 1287

11

Hydrogen storage in MOFs



Hydrogen Car? A Reality Using MOFs

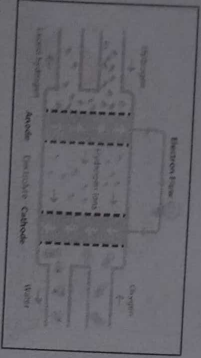
> DST is giving fund for Hydrogen and Fuel Cell Programme.

Zhao, D.; Wang, X.; Yao, L.; Hu, Y.; Chen, B. *Chem Commun* 2022, 51, 11059-11076

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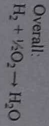
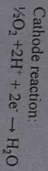
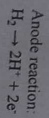
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MOFs for proton conduction



Scheme 3. Proton Exchange Membrane Fuel Cell (PEMFC)

- ❖ **Proton Exchange Membrane Fuel Cell (PEMFC):**
 - This fuel cell use a water based acidic polymer membrane as its electrolyte.
 - PEMFC operates at low temperature range (below 100°C).
 - PEMFC are potentially useful for light vehicles.



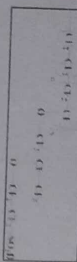
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MOFs for proton conduction

Key points:

- Proton-conducting materials are an important component of fuel cells.
- A proton conductor is a solid electrolyte, in which H⁺ are the primary charge carriers.
- Nafion is the most commonly used proton exchange membrane.

- Limitations: 1) Humidity dependent.
- 2) Losing conductivity at higher temperature.
- 3) Lack of synthetic flexibility.



14

MOFs for proton conduction

Key points:

- Unique structural features of MOFs such as their crystallinity, a regular arrangement of voids, tailorable porosity, and dynamic behavior.
- Presence of continuous H-bonding arrangement in nano channels.
- Guest dependent proton conduction behavior.
- High temperature proton conduction.
- Anhydrous proton conduction.

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MOFs for proton conduction

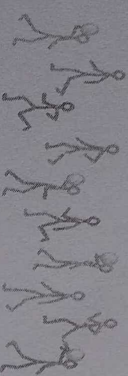
Grotthuss:

Fast exchange of protons (hopping) between neighbouring molecules.



Vehicle:

Transport of a proton as a part of a bigger species (e.g. ion).



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MOFs for proton conduction



Figure 3. 2D layer structure of framework.



Figure 4. Helical arrangement of water.

➤ This MOF shows humidity-dependent proton conductivity at elevated temperatures.

Biswas, S., Jana, H. S., Saha, S., Kumar, S. *Chem. Eur. J.* 2015, 21, 13793.

Thank you

BN
31.03.23

Green Synthesis of Silver Nanoparticles – A Review



Presented by
SOUMYA SINHA ROY
 State Aided College Teacher
 Department of Chemistry
 Polba Mahavidyalaya
 Affiliated to The University of Burdwan
 Polba, Hooghly, W.B.-712148.

ITEMS TO BE COVERED

- Terminology
- Different approaches to nanoparticle synthesis
- Why green synthesis?
- Plant extract as reducing agent
- Mechanism
- Review of literature
- Extract preparation
- Applications
- Factors affecting
- Advantages
- Conclusion
- Acknowledgement
- References

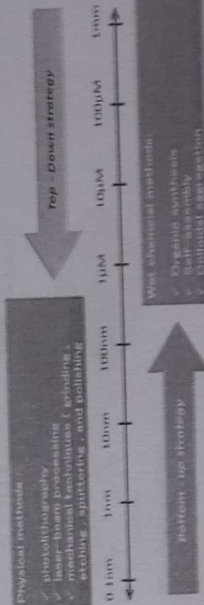
TERMINOLOGY

- **NANOPARTICLES-**
 Particles having dimension in the range of 1-100 nm
- **GREEN CHEMISTRY-**
 Utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture, and application of chemical products
- **GREEN SYNTHESIS OF NANOPARTICLES-**
 Use of biological routes such as those involving microorganisms, plants etc. for the synthesis of nanoparticles

DIFFERENT APPROACHES TO NANOPARTICLE SYNTHESIS

TOP TO BOTTOM-
 -Material is fragmented to yield a nanoparticle
 -Long Execution Time

BOTTOM TO TOP-
 -Assembling individual atoms and molecules to form nanoparticle
 -Short Execution Time



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WHY GREEN SYNTHESIS?	
METHODS	COMPARISON
PHYSICAL METHOD	Time and energy consuming, synthesis at high temp. and pressure
CHEMICAL METHOD	Simple, inexpensive and low temp. synthesis method, use of toxic reducing and stabilizing agents makes it harmful
GREEN METHOD	Easy, efficient, and eco-friendly. Eliminates the use of toxic chemicals, consume less energy and produce safer products and by products

MECHANISM

- The activation phase during which the reduction of metal ions and nucleation of the reduced metal atoms occur.
- The growth phase during which the small adjacent nanoparticles spontaneously coalesce into particles of a larger size, which is accompanied by an increase in the thermodynamic stability of nanoparticles.
- The process termination phase determining the final shape of the nanoparticles

The main mechanism considered for the route is plant-assisted reduction due to phytochemicals.

The main phytochemicals involved are:

- terpenoids,
- flavonoids,
- ketones,
- aldehydes,
- polyphenols

Antioxidant action of flavonoids resides mainly in their ability to donate electrons or hydrogen atoms

Chemical reaction:

$$2AgNO_3 + 4e^- \rightleftharpoons 2Ag + 2NO_3^-$$

Chemical reaction:


$$2AgNO_3 + 4e^- \rightleftharpoons 2Ag + 2NO_3^-$$

Thiobacillus thiooxidans

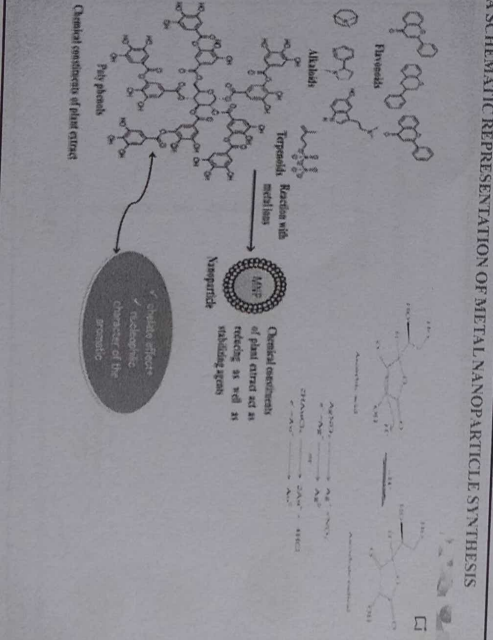
PLANT EXTRACT AS REDUCING AGENT

Plant sources containing the phyto constituents viz., Tannins, Alkaloids, Polyphenols, Flavonoids, Citric acid are

- Good reducing agents
- Easily available
- Cost effective
- Eco-friendly
- Different size and shapes of nanoparticles are also prepared using plant extracts



A SCHEMATIC REPRESENTATION OF METAL NANOPARTICLE SYNTHESIS



Handwritten signature and date: 23/10/23

REVIEW OF LITERATURE

AUTHOR	TITLE	STUDY
V. V. Makarov et al. (2014)	"Green" Nanotechnology: Synthesis of Metal Nanoparticles Using Plants	Provide a detailed analysis of the various factors affecting the morphology, size, and yield of metal Nps. Main focus was on plant bio-molecules involved in bio-reduction of metal salts during synthesis.
S. Ahmed et al. (2016)	A review on plants extract mediated synthesis of silver nanoparticles for antimicrobial applications	The paper explores the huge plant diversity to be utilized towards rapid and simple step protocol preparatory method with green principles over the conventional ones and describes the antimicrobial activities of silver nanoparticles

PLANT EXTRACT PREPARATION

CHEMICAL REQUIREMENTS:

- Freshly plant parts
- Aqueous AgNO₃ and FeCl₃
- Double distilled water
- Whatman No. 1 filter paper

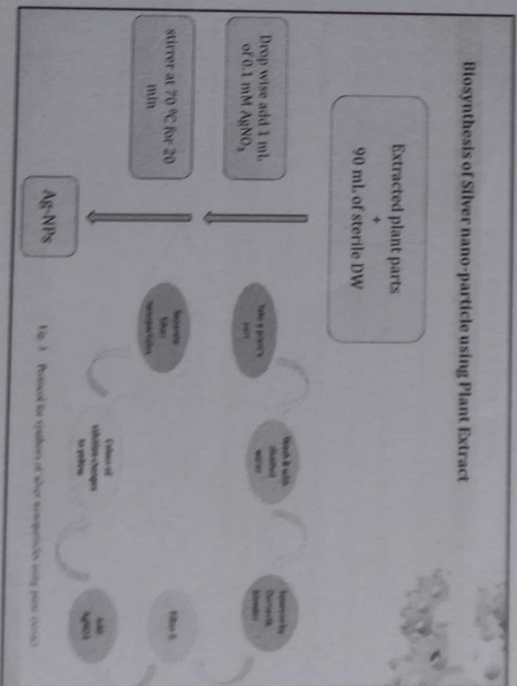
PLANT EXTRACT PREPARATION:

Fresh plant parts are washed thoroughly with double distilled water and incised into small pieces. We use 4g of finely cut plant part which is transfer into 200ml beaker containing 40ml double distilled water. It is boiled for 2 min after resting properly. The extract obtained was filtered through Whatman No. 1 filter paper and then we will store filtrate at 4°C for further use.

REVIEW OF LITERATURE

AUTHOR	TITLE	STUDY
S. Meehan et al. (2013)	Green production of zero-valent iron nanoparticles using tree leaf extracts	A green zero-valent iron nanoparticles production method was developed using tree leaves (Oak, pomegranate, and green tea leaves) originated the richest extracts. TEM analysis indicates that 10–20 nm zero-valent iron nanoparticles were obtained.

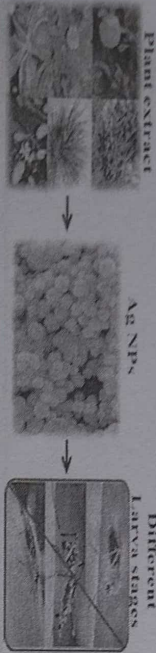
Biosynthesis of Silver nano-particle using Plant Extract



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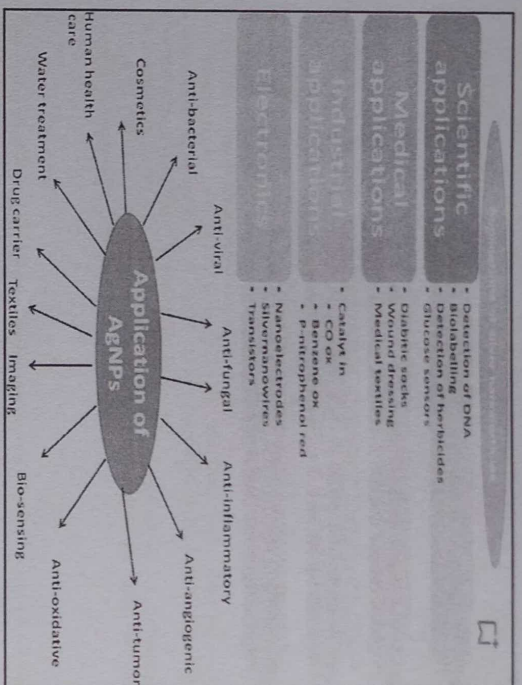
APPLICATION OF NANOPARTICLES

NANOPARTICLE	APPLICATIONS
Silver nanoparticles	<ul style="list-style-type: none"> Strong antibacterial activity against E. Coli bacteria cytotoxic activity against tumor cell lines can act as biosensor to detect ammonia promising use in water purification.
Iron nanoparticles	<ul style="list-style-type: none"> decomposition of pollutants contained in the waste water. can be used in reduction of heavy metals in drinking water. extremely reactive iron Np can solve long-lasting problems with a high content of uranium and arsenic.
Platinum nanoparticles	<ul style="list-style-type: none"> can be used as catalyst in production of hydrogen fuel elements.
Gold nanoparticles	<ul style="list-style-type: none"> can be used as catalyst in reduction of aromatic nitro compounds.



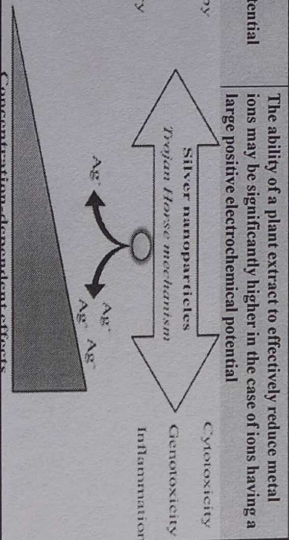
ADVANTAGES

- Easily available and does not require rigorous processing
- Directly used for NP synthesis
- Option for waste management and eco-friendly products generation.
- Leads to fast and cost effective approach
- Does not introduce new toxic products



FACTORS AFFECTING

FACTORS	DESCRIPTION
pH	affect the shape, size, and yield of nanoparticles.
Temperature	Crystal particles are formed much more frequently at high temperatures than at room temperature
Electrochemical potential	The ability of a plant extract to effectively reduce metal ions may be significantly higher in the case of ions having a large positive electrochemical potential
Anticancer therapy	Silver nanoparticles
Antiviral therapy	Trypan Blue mechanism
Anti-inflammatory	Cytotoxicity
Diagnosics	Genotoxicity
	Inflammation



21.03.23

CONCLUSION

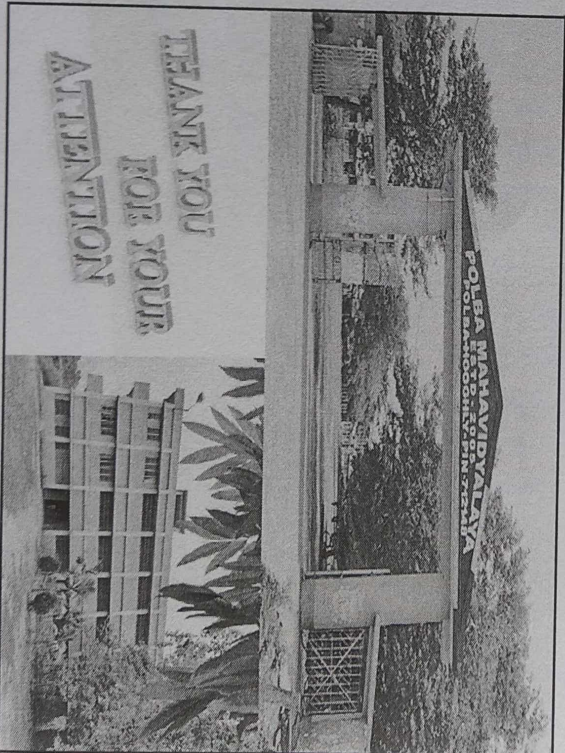
- This review article concludes that silver nanoparticles which have properties of **anti-microbial, anti-fungal and anti-viral** when synthesized using naturally occurring biomaterials (**green/ecofriendly materials**) results in toxicity free product without disturbing environment and also it is an economical approach for wide variety of treatments which could also change the fate of pharmaceutical field in upcoming days.

REFERENCES

1. Shehzad, A., Qureshi, M., Jabben, S., Ahmad, R., Alabdjalil, A. H., Aljafary, M. A., & Al-Suhaimi, E. (2018). Synthesis, characterization and antibacterial activity of silver nanoparticles using *Rhazya stricta*. *PeerJ*, 6, e6086.
2. Hekmati, M., Hasanirad, S., Khaledi, A., & Esmaili, D. (2020). Green synthesis of silver nanoparticles using extracts of *Allium rotundum* L, *Falcaria vulgaris* Bernh, and *Ferulago angulate* Boiss, and their antimicrobial effects in vitro. *Gene Reports*, 100589.
3. Benakashani, F., Alalchian, A. R., & Jalali, S. A. H. (2016). Biosynthesis of silver nanoparticles using *Capparis spinosa* L. leaf extract and their antibacterial activity. *Karabala International Journal of Modern Science*, 2(4), 251-258.
4. Ahmed, S., Ahmad, M., Swarni, B. L., & Ikram, S. (2016). A review on plants extract mediated synthesis of silver nanoparticles for antimicrobial applications: a green expertise. *Journal of advanced research*, 7(1), 17-28.
5. Makarov, V. V., Love, A. J., Smitsyna, O. V., Makarova, S. S., Yaminsky, I. V., Taliansky, M. E., & Kalina, N. O. (2014). "Green" nanotechnologies: synthesis of metal nanoparticles using plants. *Acta Naturae*, 6(7) (20).
6. Machado, S., Pinto, S. L., Grosso, J. P., Nows, H. P. A., Albergaria, J. T., & Delerue-Matos, C. (2013). Green production of zero-valent iron nanoparticles using tree leaf extracts. *Science of the Total Environment*, 445, 1-8.

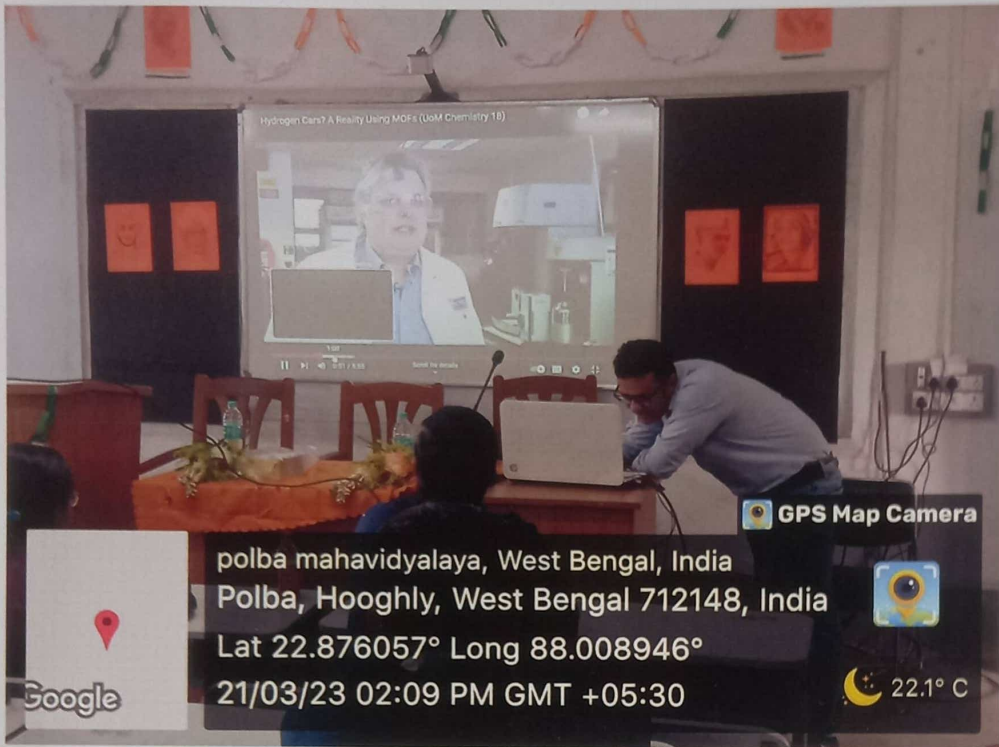
ACKNOWLEDGEMENT

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- I also acknowledge with a deep sense of reverence, my gratitude towards my parents, my family, my Gurus' and my beloved Students.

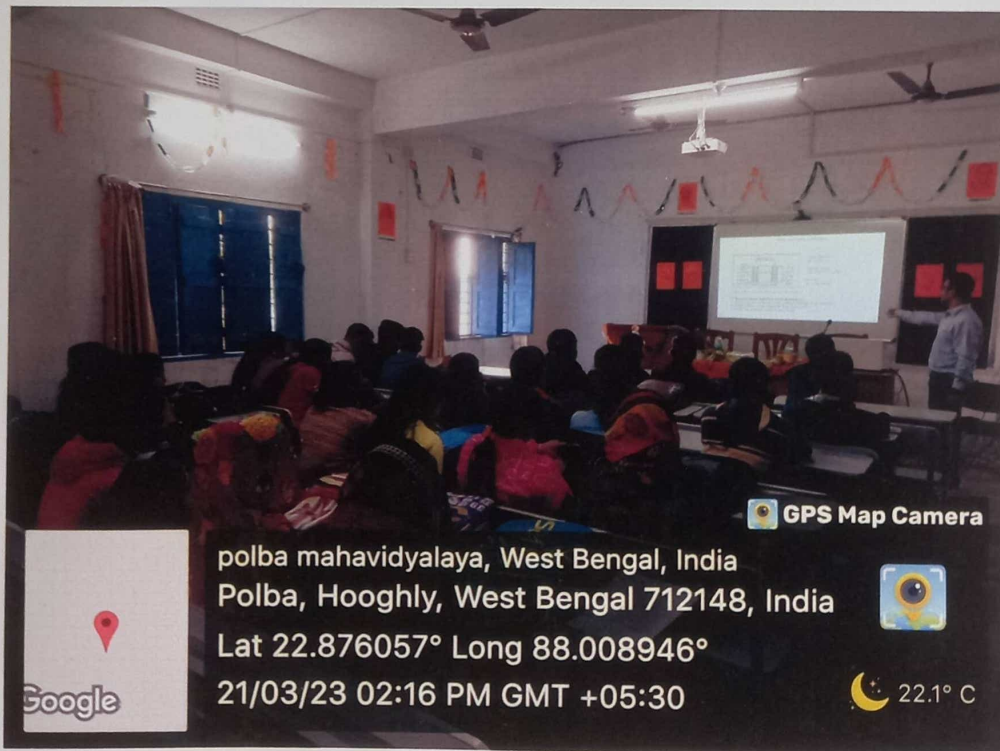


31.03.23

Speech by Dr. S. Biswas

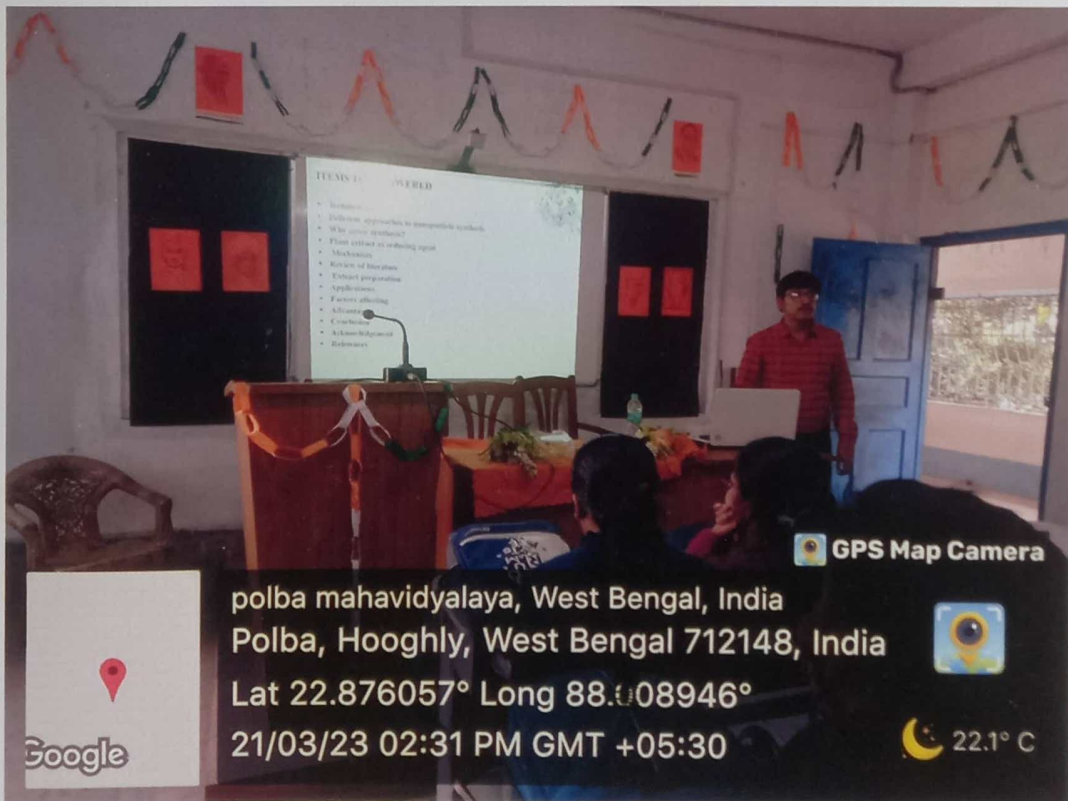
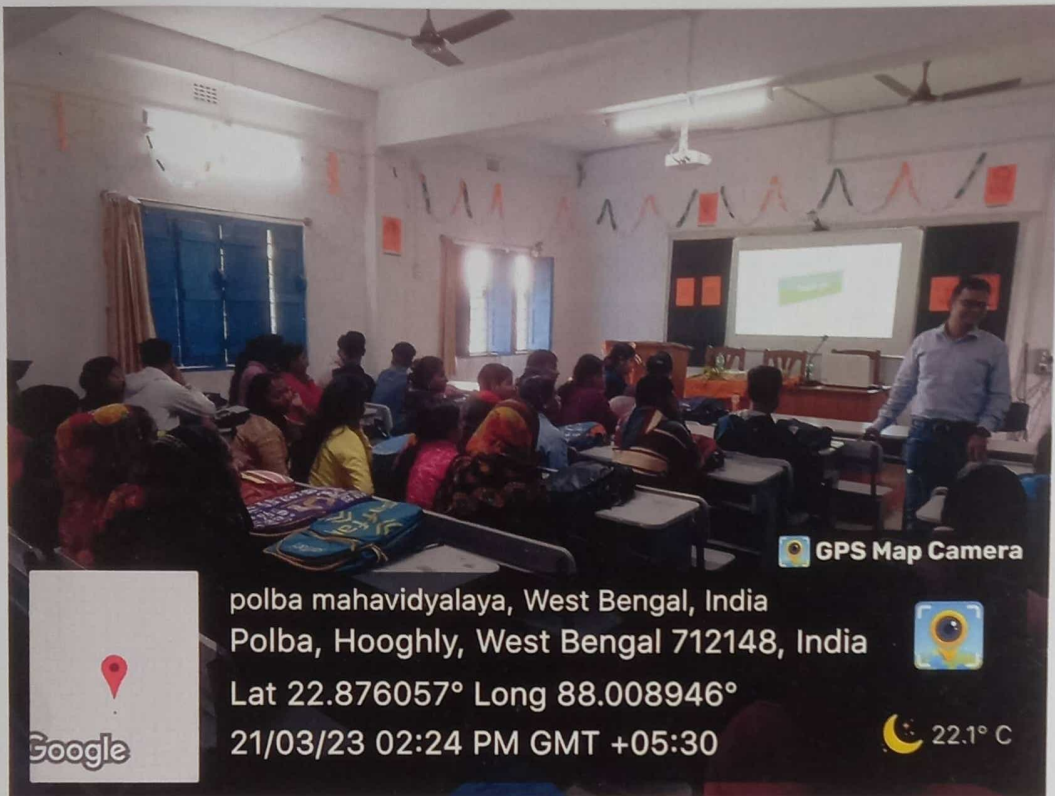


Speech by Dr. S. Biswas



S. Biswas
31.03.23

Speech by Dr. S. Biswas



Speech by Mr. Soumya Sinha Roy

31.03.23



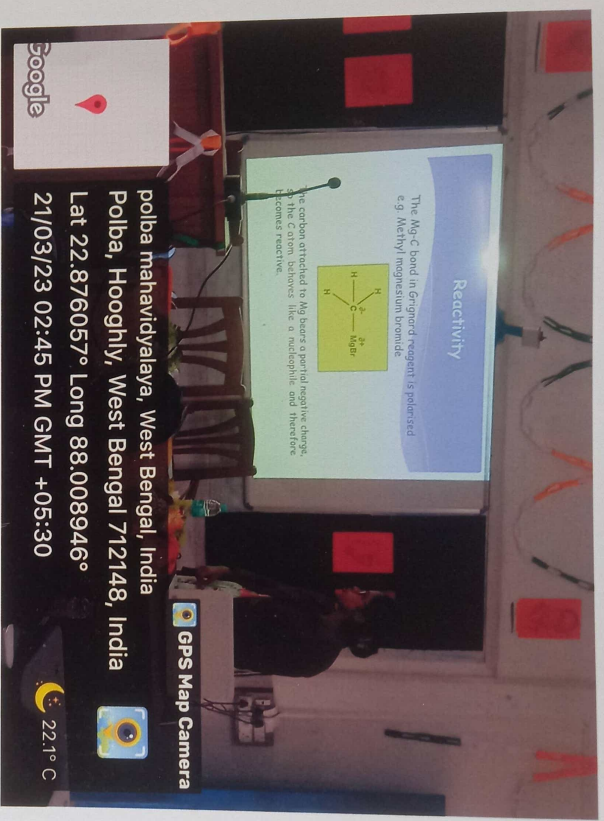
Audience



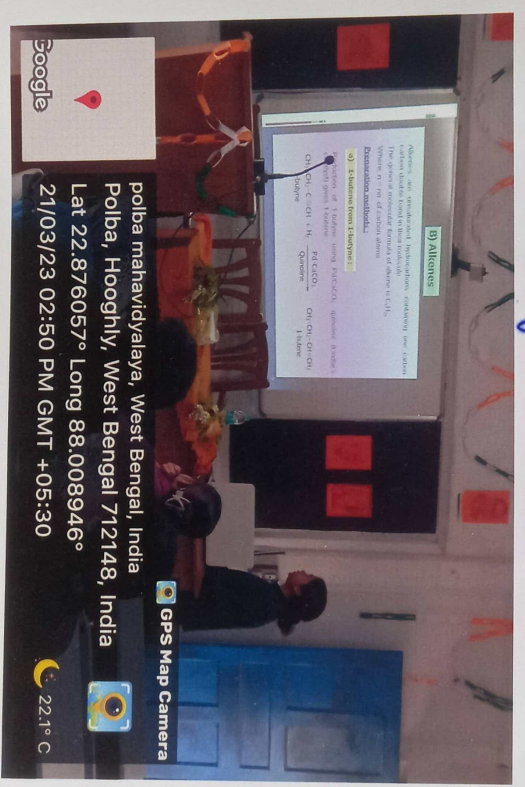
Speech by Mr. Soumya Sinha Roy

*AM
21/03/2023*

Presentation by Ms. Keya Das



Presentation by Ms. Isha Das





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To whom it may concern

I am to state that Dr. Soumava Biswas, Former Post Doctoral Researcher, Brno University of Technology, Central Institute of Technology, Czech Republic, delivered a seminar lecture at Polba Mahavidyalaya on 21-03-2023 in the capacity of a distinguished Resource Person.

(Narugopal Kaibarta)

21/3/2023



Teacher in Charge
Polba Mahavidyalaya
Polba, Hooghly, West Bengal

D. Biswas
21/3/2023

Soumava Biswas

31/03/23

Bill

Received Rs.1,000/- (Rupees One Thousand only) from Polba Mahavidyalaya as
Honorarium for attending Seminar as Resource Person organized by Polba
Mahavidyalaya on.....

Full Name : Dr. Soumava Biswas

Signature : *Soumava Biswas*

with date 21/02/2023

[Signature]
31.03.23