

Curriculum Vitae

Abir Chandan Barai

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Career Objective: To secure a challenging position where I can effectively contribute my skill and competent professional skills.

Academic Qualifications:

Degree	Board/University	Percentage	Passing year
PhD (Chemistry)	Vidyasagar University, Midnapore, West Bengal, India	NA	Ongoing (Thesis Submitted)
M.Sc. (Chemistry)	Vidyasagar University, Midnapore, west Bengal, India	81.25%	2014

Project work

1. **Project Title :** “*Chemical investigation on Asthavarga Plants and Self-assembly study of Sigmastrol and Crotocebaneic acid*”

Description: UGC-MRP, UGC-RGNF

Supervisor: Professor Braja Gopal Bag, Department of Chemistry, Vidyasagar University, Midnapore- 721102, West Bengal, India.

2. **Project Title:** “*Study of Antioxidant Property of root Extract of Habnaria edgowrthi (Vridhhi) and its use in the synthesis of Gold nanoparticles.*”

Description: M.Sc. project (July 2013–June 2014)

Supervisor: Prof. Braja Gopal Bag, Department of chemistry and chemical technology, Vidyasagar University, Midnapore- 721102, West Bengal, India.

Key skill:

- Extraction, purification and characterization of terpenoid, steroid and fatty acid based natural product from plants.
- Synthesis, purification and characterisation of derivatives of the extracted natural products.
- Skilled in isolation and purification of organic compounds by column chromatography and crystallisation.
- Interpretation of ^1H and ^{13}C NMR signals (by 2D NMR), MS, IR, UV-VIS, Fluorescence, XRD, Rheology.
- Microscopic techniques Optical microscopy, SEM, TEM and AFM.
- Hands on experience in Optical microscopy, UV-Vis, Fluorescence, Fluorescence life time, HPLC, GCMS, IR, DLS, Chromatography, Rheology.
- Running Gaussian 09 program package, and PCM for theoretical calculation.
- Experience in working with Basic Chemistry Software (ChemOffice, Microcal Origin, Endnote etc) and Photographic software like Corel draw and Adobe Photoshop.

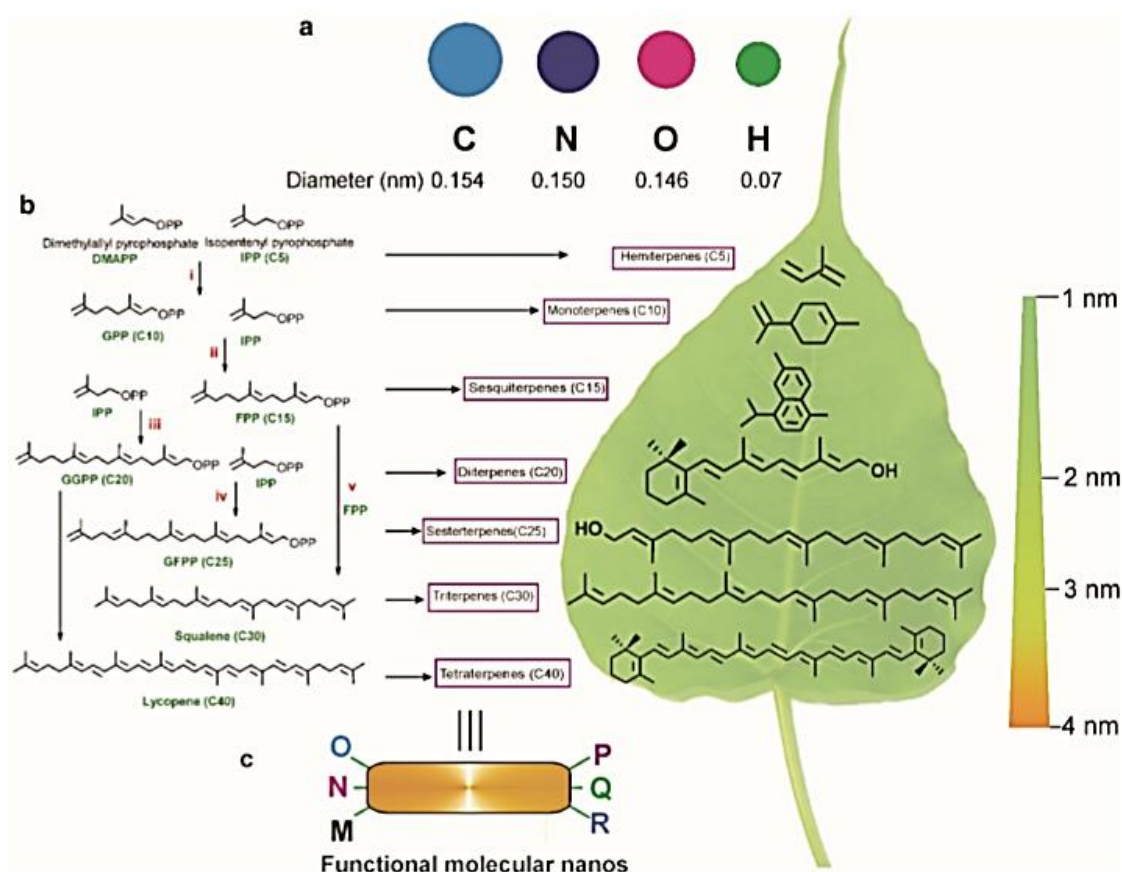
Awards/Scholarship:

- ❖ Qualified All INDIA-GATE in chemistry (Graduate Aptitude Test in Engineering), GATE - 2015 Rank- **1270** Selected
- ❖ **UGC-RGNF** for Research Fellowship in the year 2015.

Research summary:

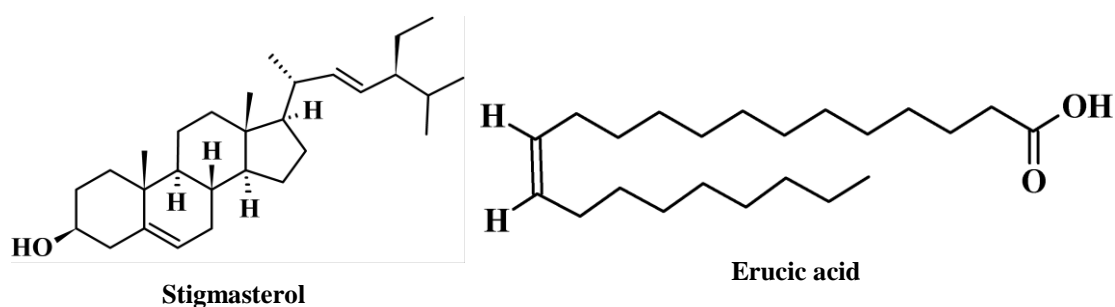
Terpenoids, nano-entities and molecular self-assembly

Terpenoids having nanometric lengths, commonly having several functional groups and several centers of chirality, can be utilized as renewable Molecular Functional Nanos (MFNs). The terpenoids spontaneously self-assembled in liquids yielding different morphologies such as vesicles, tubes, flowers, petals and fibers of nano- to micro-meter dimensions and supramolecular gels. The self-assemblies were utilized for the entrapment and release of fluorophores including anticancer drug, pollutant capture, generation of hybrid materials and catalysis.



Chemical investigation on “Astavarga” plants and their antioxidant property

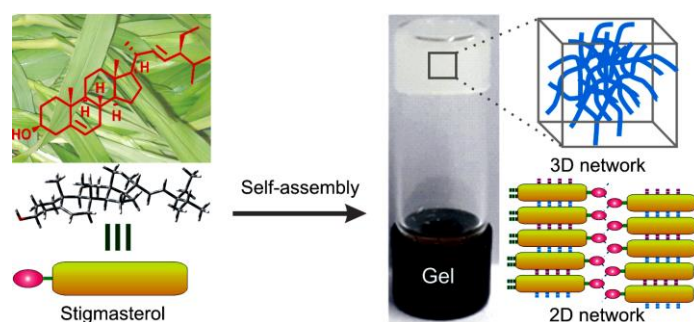
Stigmasterol and Erucic acid are two compounds isolated from leaves *Roscoea purpurea*(kakoli) and pseudobulb of *Crepidium acuminatum*(Jeevak) plant respectively. These two plants are the most important plant of “Astavarga” group. Astavarga plants are found in Himalayan area of India.



With an aim to investigate the chemical constituents of various parts of the medicinal plants Kakoli (*Roscoea purpurea*) and Jeevak (*Crepidium acuminatum*), we have isolated stigmasterol from the leaves of *Roscoea purpurea* and erucic acid from the pseudo-bulb of jeevak and characterized by spectroscopic methods. To our knowledge, this is the first report of the isolation of stigmasterol and erucic acid in Kakol and Jeevak respectively. Molecular modeling studies have revealed that stigmasterol can act as a functional nano-entity with tremendous potential application in supramolecular chemistry and nano-science.

Self-assembly study of Stigmasterol in organic liquids

Stigmasterol, a naturally occurring 6-6-6-5 monohydroxy phytosterol, was extracted from the leaves of Indian medicinal plant *Roscoea purpurea*, commonly known as

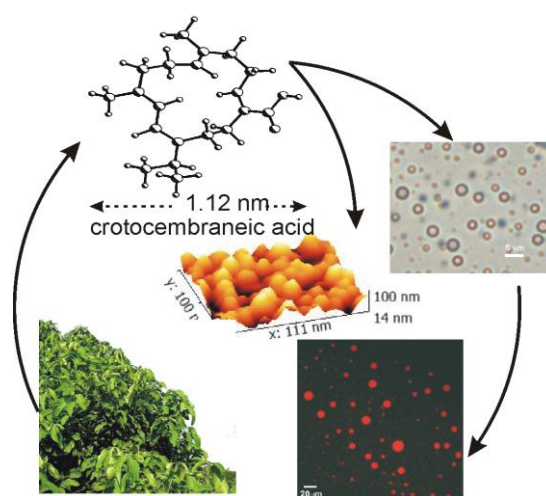


Kakoli. The molecule self-assembled in organic liquids yielding supramolecular gels in most of the liquids studied via the formation of fibers and belt-like architectures of

nano-to micrometer diameter. The supramolecular gels could entrap fluorophores such as rhodamine B, carboxy fluorescein including the anticancer drug doxorubicin. Additionally, release of the loaded fluorophores including the anticancer drug from the gel into aqueous medium was also demonstrated. Biosynthetically sterols being of triterpenoid origin, stigmasterol joins the larger family of terpenoid based natural products yielding self-assemblies and gels in liquids.

Self-Assembly Study of Crotoembraneic Acid

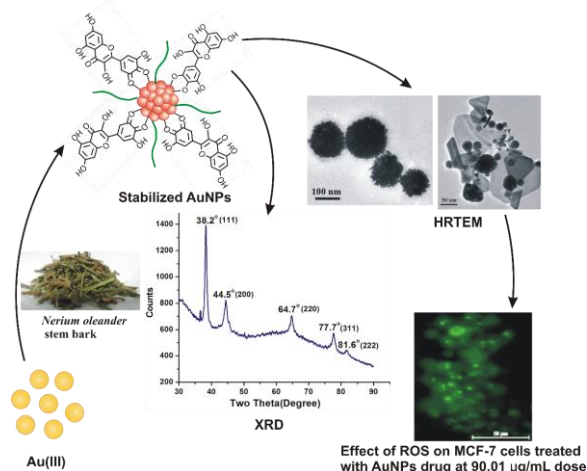
Crotoembraneic acid was extracted from the leaves of *Croton oblongifolius* Roxb. The carboxyl group forming a polar head group and the macrocycle forming a highly hydrophobic tail, crotoembraneic acid turned out to be a unique macrocyclic amphiphile for the study of its self-assembly properties in various liquids.



We have reported the formation of vesicular self-assemblies of a naturally occurring macrocyclic diterpenoid crotoembraneic acid in aqueous media yielding vesicular self-assemblies. According to our knowledge, this is the first report of the formation of vesicular self-assemblies of a diterpenoid. Evidence for the formation of a bilayer vesicular structure has been obtained from HRTEM and X-ray diffraction studies. Thus crotoembraneic acid joins the rare class of macrocyclic natural products yielding vesicular self-assemblies in aqueous binary solvent mixtures. Entrapment of both cationic as well as anionic fluorophores including the anticancer drug doxorubicin inside the vesicles has also been demonstrated.

Green synthesis of gold-conjugated Nerium oleander nanoparticles and study of its invitro anticancer activity on MCF-7 cell lines and catalytic activity

The phytochemicals present in the stem bark extract of *Nerium oleander* (commonly known as Karabi) have been utilized for the green synthesis of stable gold-conjugated nanoparticles at room temperature under very mild conditions. The green synthesized gold-conjugated nanoparticles were characterized by Surface Plasmon Resonance spectroscopy, High resolution transmission electron microscopy, X-Ray diffraction studies and



Dynamic Light Scattering. A mechanism for the synthesis and stabilization gold-conjugated nanoparticles (AuNPs) has been proposed. Anticancer activity of the stabilized AuNPs studied against MCF-7 breast cancer cell line revealed that the stabilized AuNPs were highly effective for the apoptosis of cancer cells selectively. The antioxidant activity of the stem bark extract of *Nerium oleander* has also been studied against a long lived 2,2-diphenylpicrylhydrazyl (DPPH) radical at room temperature. Moreover, the utilization of the stabilized AuNPs as a catalyst has also been demonstrated.

List of Publications:

1. B. G. Bag, **A. C. Barai**, Self-assembly of naturally occurring stigmasterol in liquids yielding a fibrillar network and gel, *RSC Adv.*, **2020**, 10, 4755
2. B. G. Bag, **A. C. Barai**, S. N. Hasan, S. K. Panja, S. Ghorai, S. Patra, Terpenoids, nano-entities and molecular self-assembly, *Pure and Applied Chemistry*, **2019**, doi.org/10.1515/pac-2019-0812.
3. **A. C. Barai**, K. Paul, A. Dey, S. Manna, S Roy, B. G. Bag, C. Mukhopadhyay Green synthesis of Nerium oleander-conjugated gold nanoparticles and study of its in vitro anticancer activity on MCF-7 cell lines and catalytic activity, *Nano Convergence*, **2018**, 5,10.

4. B.G. Bag, **A.C. Barai**, K. Wijesekera, P. Kittakoop, First Vesicular Self-Assembly of Crotoembraneic Acid, a Nano-Sized Fourteen Membered Macrocyclic Diterpenic Acid, *Chemistry Select*, **2017**, 2, 4969 – 4973.
5. B. G. Bag, S. Das, S. N. Hasan, **A. C. Barai**, Nanoarchitectures by hierarchical self-assembly of ursolic acid: entrapment and release of fluorophores including anticancer drug doxorubicin, *RSC Adv.*, **2017**, 7, 18136-181343.
6. K. Chaudhuri, S. N. Hasan, A. C. Barai, S. Das, T. Seal, B. G. Bag, Green synthesis and characterization of gold nanoparticles using *Bursera serrata* fruit extract, *Asian Journal of Pharmacy and Pharmacology*, **2019**; 5:332-343.
7. C. Garai, S. N. Hasan, A. C. Barai, S. Ghorai, S. K. Panja, B. G. Bag, Green synthesis of Terminalia arjuna-conjugated palladium nanoparticles (TA-PdNPs) and its catalytic applications, *J. Nanostruct. Chem.*, **2018**, 8, 465.
8. K. Chaudhuri, S. N. Hasan, **A. C. Barai**, S. Das, T. Seal, B. G. Bag, Nutraceutical Evaluation of *Rhynchochotum ellipticum*, a potent wild edible plant consumed by the tribal of North-Eastern region in India and Green Synthesis of Gold Nanoparticles using its leaf extract, *Journal of Pharmacognosy and Phytochemistry*, **2018**, 7, 1434-1442.
9. B. G. Bag, S. Das, S. N. Hasan, **A. C. Barai**, S. Ghorai, S. K. Panja, C. Garai, S. Santra, Terpenoids in Early 21st Century: From Renewable Functional Nano-entities to Advanced Materials, *Prayog. Ras.*, **2018**, 2, 1-23.
10. K. Chaudhuri, S. N. Hasan, **A. C. Barai**, S. Das, T. Seal, B. G. Bag, Green synthesis of gold nanoparticles using *Wendlandia wallichii*, a potent wild edible plant consumed by the tribal of north-eastern region in India, *The Pharma Innovation Journal*, **2018**, 6, 437-446.

List of conference presentations:

1. **Abir C. Barai** , S. Ghorai, Sk N. Hasan, S.K. Panja, B. G. Bag. SCBFM 2018, IISER Kolkata. (Best Poster Prize)
2. **Abir C. Barai** and B. G. Bag, IISF, Young Scientist Conference 2018, Govt. Of India, Indira Gandhi Pratisthan, Lucknow, International, poster presentation.
3. Abir C. Barai and B. G. Bag, Frontiers in Chemical Sciences , National symposium 2019, poster presentation.

4. Abir C. Barai and B. G. Bag, Frontiers in Chemical Sciences & Food Processing, Preservation and Packaging , National symposium 2018, poster presentation
5. Abir C. Barai and B. G. Bag, Frontiers in Chemical Sciences 2016 & Food Processing, Preservation and Packaging 1422, National symposium 2016, poster presentation.
6. Science Academics' Lecture Workshop on "Chemistry and Biology Interface".
7. Abir C. Barai and B. G. Bag, Rasayan-2017, International, poster presentation.
8. March, 2017: National Symposium On Natural Resource Management- 2017.
9. International Conference on Emerging Materials (ICEM 2017).
10. February, 2018: Science Academies' Three Days Lecture Workshop on Recent Advancements and Achievements in Chemical Sciences.

Personal Information

Mr. Abir Chandan Barai

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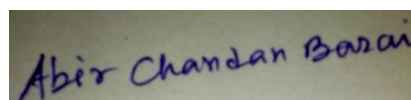
Sex: Male

Marital Status: Single

Spoken Languages: English, Bengali (mother tongue), Hindi

Declaration:

I, hereby declare that the above-furnished particulars are true to the best of my knowledge and belief. If given a chance, I will prove my efficiency, my loyalty and willingness to work.



Abir Chandan Barai