

Dr. Susovan Bhowmik

Date of Birth: Dec 29th, 1981

Nationality: Indian;

Gender: Male

Email: susovan.bhowmik@gmail.com

Permanent address: At- Parbotipur, P.O- Tamluk, Dist- Midnapur(EAST)(W.B), INDIA.

Mobile No: 7431911306



Current Position: *Assistant Professor of Chemistry (Bankura Sammilani College)*

Educational Qualifications:

2007	Post Graduation	(M.Sc.)	Banaras Hindu University, Banaras, India.
2004	Graduation	(B.Sc.)	Midnapur College, Vidyasagar University.
2000	Intermediate	(10+2)	Tamluk Hamilton High School
1998	High School	(10)	Ramkrishna Mission Vidyapith, Purulia

Ph.D.:

2007 - 2013	Thesis title: “Control of Spins in Axially Ligated Diiron(III)bisporphyrin and Studies on Fe(III) and Mn(III) μ-hydroxo Complexes”	IIT – Kanpur, Kanpur, India (supervisor:- Prof. S. P. Rath, Department of Chemistry, IIT – Kanpur, Kanpur, India)
-------------	--	--

Post-Doc Experience:

2013 - 2014	(Prof. Achim Muller)	University of Bielefeld, Germany
2014 – 2016	(Prof. Zeev Gross)	IIT – Technion, Israel
2016-2017	IACS-Kolkata	<i>SERB Young Scientist (Fast Track project) at IACS-Kolkata</i>

Research Projects:

1. File Number: TAR/2022/000192 SERB, New Delhi funded project : Ongoing
2. File Number: YSS/2015/001635 SERB, New Delhi Funded project : Completed

Membership of professional bodies:

1. Member, Indian Chemical society

Professional experience:

2009 – 2010	Inorganic Chemistry (CHM 201) as tutor	IIT – Kanpur, Kanpur, India.
-------------	--	------------------------------

2009 – 2010 Inorganic Chemistry (CHM 101) as IIT – Kanpur, Kanpur, India.
 tutor for practical classes

Teaching for 2016-17 academic year. N. D. College, Howrah

Currently Guest Faculty Bankura University, Bankura.
 Kazi Nazrul University, Asansol
 Panskura Banamali College, Panskura

Awards:

2007 Qualified **National Eligibility Test** (CSIR-NET) in the subject Chemical Sciences (JRF and SRF awards)

2007 Qualified Graduate Aptitude Test for Engineering (GATE) in Chemistry

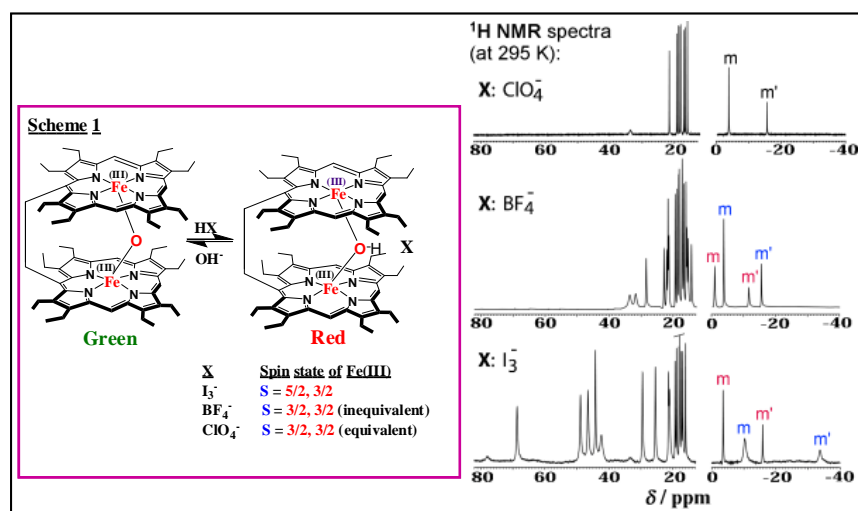
2018 SERB, New Delhi travel grant for symposium in Japan.

Skills & experience:

- Synthesis, purification and characterization of moisture and air-sensitive compounds using standard Schlenk line technique and Glove box.
- Handling the synthesis of organic and transition metal compounds from milligram to multi-gram scale.
- Mass, NMR and High resolution multi-nuclear NMR (^{13}C , ^{19}F , ^{31}P) spectral analysis.
- UV-visible, IR, Fluorescence, EPR, Magnetism (SQUID) and electrochemical analysis.
- Single crystal X-ray structure analysis using SHELXTL-97, WINGX, SIR97, DIAMOND, ORTEP and PLATON, and usage of basic technical packages like origin, chemdraw etc.
- Computational Modeling using Gaussian 03, ADF and Cache program package: Geometry optimization of stationary state, Population analysis of molecular orbital, potential energy surface Scan.

Research Interest:

My PhD work (with **Prof. S. P. Rath**, IIT-K) mainly dealt with the synthesis and characterization

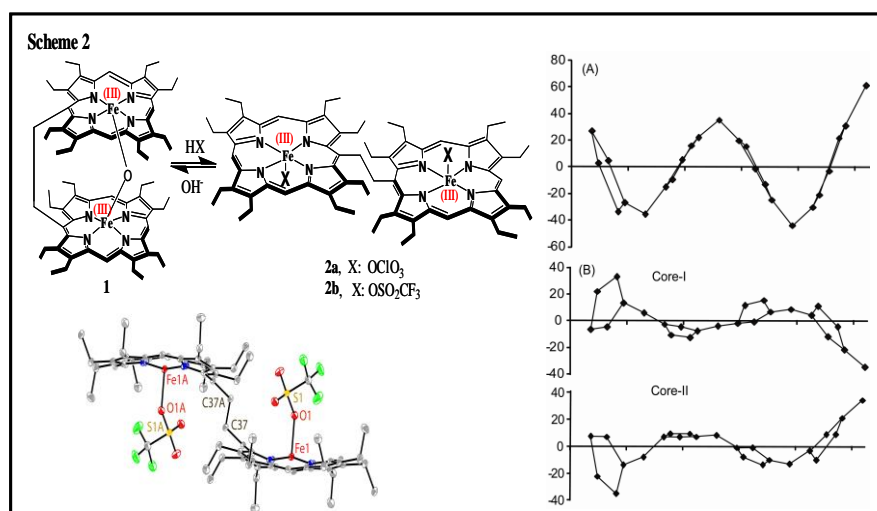


of porphyrin and bisporphyrin and its derivatives for better understanding of the structure-function-reactivity relationships of heme proteins, by the study of model hemes. The major focus of my research was to investigate the relationship

between the macrocycle distortion and the properties of the metal center in porphyrin complexes in order to understand functions of chemically similar tetrapyrrole pigments found in nature. Cofacial bisporphyrins are currently a topic of immense interest, particularly because of their numerous applications in catalysis and photophysical properties. The most successful cofacial bisporphyrin systems studied to date appear to be related to the so-called “Pac-Man” porphyrin system and have drawn considerable interest due to their small-molecule reactivity. First direct support for this crucial conformational change in a single framework which demonstrates the unprecedented ability to open and close its binding pocket by forming bisiron(III) μ -oxo dimers. Upon protonation, a novel series of μ -hydroxo species are generated in which two iron centers become inequivalent and have different spin states that also varied with the counter anions.

Chem. Eur. J. **2012**, *18*, 13025.

Chem. Eur. J. **2013**, *19*, 17846.



Elucidation of the electronic structure of iron porphyrins is quite important to understand the function and catalytic activities of naturally occurring heme proteins. I tried to understand how macrocyclic deformation in metallo porphyrins play

a pivotal role in dictating spin state of iron. Reed and Guiset have succeeded in ranking the ligand field strength for iron(III) porphyrins in a magneto-chemical series based on the concept of admixed spin states as follows: $\text{Ag}(\text{CB}_{11}\text{H}_{12})_2^- < \text{CB}_{11}\text{H}_{12}^- < \text{SbF}_6^- < \text{Co}(\text{C}_2\text{B}_9\text{H}_{11})_2^- < \text{AsF}_6^- < \text{ClO}_4^- < \text{C}(\text{CN})_3^- < \text{CF}_3\text{SO}_3^- < \text{BF}_4^- < \text{ONC}(\text{CN})_2^- < \text{ReO}_4^- < \text{OTeF}_5^-$. Accordingly ClO_4^- , being relatively weaker field ligand, generally forms complex with intermediate/admixed intermediate spin while CF_3SO_3^- forms mostly spin-admixed complex with predominant high-spin contributions. I reported the complete reversal of the ligand field strength between ClO_4^- and CF_3SO_3^- on the magnetochemical series, for the first time, in a single molecular framework. It has been observed the stabilization of pure intermediate spin iron in a diiron(III)bisporphyrin with CF_3SO_3^- axial ligand while with ClO_4^- , high-spin complex is formed.

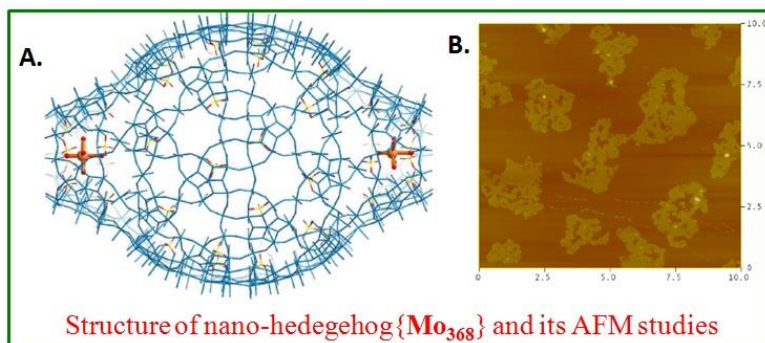
Chem. Commun. **2011**, *47*, 4790.

I could stabilize for the first time, pure intermediate spin state of heme with a phenolate axial ligand in a bisporphyrin frame work, using picric acid as a phenolate ligand.

Chem. Eur. J. **2013**, *19*, 13732.

Chemical Science. **2016**, *7*, 1212.

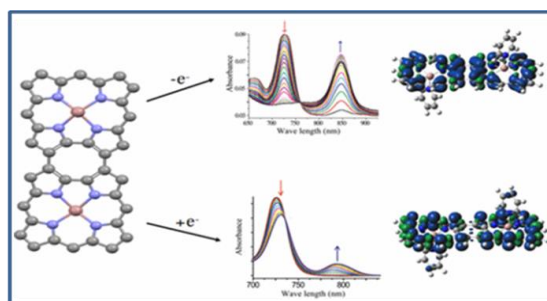
- ❖ My 1stPost-doc (with **Prof. Achim Muller**, University of Bielefeld, Germany) involved research in polyoxometallate chemistry, which involved formation of nano clusters of protein size, providing scope for coordination chemistry inside cavity. All the reaction were done in water medium.



Soft Matter. **2015**, *11*, 2372.

- ❖ My 2nd Post-doc (with **Prof. Zeev Gross**, IIT-technion, Israel) involved studies of monomeric corrole in water oxidation, O₂ reduction by electrochemical method.

Inorg. Chem. **2017**, *56*(4), 2287.



List of Publications:

1. D. Sil, **S. Bhowmik**, S. P. Rath.
“Experimental and theoretical investigation of a novel dimanganese(III) μ -hydroxo Bisporphyrins: magneto-structural correlation and effect of metal spin on porphyrin core deformation.”
Inorg. Chem. **2016**, *55*, 3239.
2. **S. Bhowmik**, M. kosa, Z. Gross.
“The antiaromatic cyclooctatetraene bridge in bimetallic macrocycles: Isolating or conjugating.”
Inorg. Chem. **2017**, *56*(4), 2287.
3. D. Sil, S. Dey, A. Kumar, **S. Bhowmik**, S. P. Rath.
“Oxidation triggers extensive conjugation and unusual stabilization of two diheme dication diradical intermediates: role of bridging groups for electronic communications.”
Chemical Science. **2016**, *7*, 1212.

4. S. Garai, A. Merca, **S. Bhowmik**, H. E. Moll, H. Li, F. Haso, H. Noguira, T. Liu, L. Wu, P. Gouzerh and A. Muller
“Hedgehog-shaped {Mo₃₆₈} cluster: Unique electronic/structural properties, surface encapsulation and related self-assembly into vesicle and films.”
Soft Matter. **2015**, *11*, 2372.
5. **S. Bhowmik**, S. Dey, D. Sahoo and S. P. Rath
“Unusual Stabilization of an Intermediate Spin State of Iron upon the Axial Phenoxide Coordination of a Diiron(III)-Bisporphyrin: Effect of Heme-Heme Interactions.”
Chem. Eur. J. **2013**, *19*, 13732.
6. **S. Bhowmik**, S. K. Ghosh and S. P. Rath
“Protonation of an oxo-Bridged Diiron Unit Makes Two Iron Centers Different: A New Class of Diiron(III)- μ -hydroxo Bisporphyrin and Control of Spins by Counter Anions”
Chem. Eur. J. **2012**, *18*, 13025.
7. **S. Bhowmik**, S. K. Ghosh and S. P. Rath
“Control of Spins by Ring Deformation in a Diiron(III)bisporphyrin: Reversal of ClO₄⁻ and CF₃SO₃⁻ Ligand Field Strength on the Magnetochemical Series.”
Chem. Commun. **2011**, *47*, 4790.
8. **S. Bhowmik**, D. Sil, R. Patra and S. P. Rath
“Axial Phenoxide Coordination on Di-Iron(III)bisporphyrin: Insights from Experimental and DFT Studies.”
J. Chem. Sci. **2011**, *123*, 827 (INVITED ARTICLE).
9. R. Patra, **S. Bhowmik**, S. K. Ghosh and S. P. Rath
“Effects of Axial Pyridine Coordination in a Saddle-Distorted Porphyrin macrocycle: Stabilization of Hexa-coordinated High-Spin Fe(III) and Air-stable Low-Spin Iron(II) Porphyrinates.”
Dalton. Trans. **2010**, *39*, 5795.
10. R. Patra, **S. Bhowmik**, S. K. Ghosh and S. P. Rath
“The Effect of Steric Crowding on Porphyrin Conformation and Ring Orientations in a Series of Iron(III) μ -Oxo Dimers Containing meso-Nitrooctaethylporphyrins.”
Eur. J. Inorg. Chem. **2009**, *5*, 654.
11. S. Ghosh, **S. Bhowmik** and S. P. Rath
“Effect of Heme-Heme Interactions and Modulation of Metal Spins by Counter Anions in a Series of Diiron(III)- μ -hydroxo Bisporphyrins: Unusual Stabilization of Two Different Spins in a Single Molecular Framework.”
Chem. Eur. J. **2013**, *19*, 17846.
12. F S. T. Khan, S. J. Shah, **S. Bhowmik**, F. G. C. Reinhard, M. A. Sainna, S. P. de Visser* and S. P. Rath*
“Equatorial ligand plane perturbations lead to a spin-state change in an iron(III)porphyrin dimer.”

Dalton Trans. (Communication) 2019, 19, 6353.

After joining Bankura Sammilani College

13. Sushila, Swati Dhamija, Moumita Patra, Jacques Pécaut, Jacques Pécaut, Ramesh Kataria, Soumyabrata Goswamy, Susovan Bhowmik and Ranjan Patra

‘Probing the structural features and magnetic behaviors of dinuclear Cobalt(II) and trinuclear Iron(III) Complexes’

Inorg Chimica Acta 2022, 535, 120852.

14. Mizrahi, Amir; Bhowmik, Susovan; Manna, Arun; Sinha, Woormileela ; Saphier, Magal; Mahammed, Atif; Patra, Moumita; Fridman, Natalia; Zilbermann, Israel; Kronik, Leor; Gross, Zeev; Kumar, Amit

"Electronic Coupling and Electrocatalysis in Redox Active Fused Iron Corrole"

Inorganic Chemistry, 2022 (Accepted)

15. Book Chapter:

Oxygen Reduction Reaction by Metalloporphyrins and Metallophthalocyanines- published in

a book entitled ‘Oxygen reduction reaction: Fundamentals, Materials and Applications’

with Elsevier. ISBN: 9780323907200

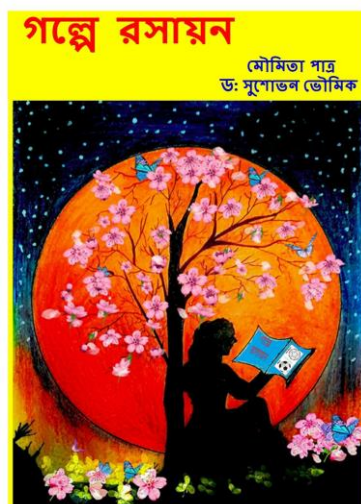
Susovan Bhowmik, Arvind Chaudhury, Moumita Patra and Ranjan Patra

Popular Science:

16. “শতবর্ষে ইনসুলিন” জ্ঞান ও বিজ্ঞান (ডিসেম্বর, 2022).

17. Popular Science book ‘GOLPE RASAYAN’ published by Indian Chemical Society.

ISBN: 978-93-94862-01-2



Work Presented in Conferences:

1. S. Bhowmik, S.K. Ghosh and S. P. Rath.
“**A Novel Series of Oxo and Hydroxo Bridged Fe(III) Bisporphyrins: Synthesis, Structure and Properties.**” 3rd Asian Conference on Coordination Chemistry (ACCC-3), held at Indian Habitat Center- New Delhi, India from Oct. 4-7, 2011.
2. S. Bhowmik, S.K. Ghosh and S. P. Rath.
“**A Novel Series of Oxo and Hydroxo Bridged Fe(III) Bisporphyrins: Synthesis, Structure and Properties.**” International Symposium on Frontiers in Inorganic Chemistry (FIC-2010), held at IACS, Kolkata from December 11-13, 2010.
3. S. Bhowmik, Z. Gross
“**Corroles fused by the antiaromatic cyclooctatetraene (COT) moiety: new insights obtained by investigations of the free base and its bis-gallium(III) complex**” Israel Chemical Society (ICS-2016) Symposium, held at Tel-Aviv from February 2-5, 2016.
4. S. Bhowmik, A. Dey
“**The antiaromatic cyclooctatetraene bridge in bimetallic macrocycles: isolating or conjugating?**” CRSI 2016 symposium, held at North Bengal University from June 17-20, 2016.
5. Oral Lecture: **Decoding The COT Island(?) Enlapped by Corrole Mainlands.**
SABIC-2017, Held at Kolkata from January 7-11, 2017
6. Invited Lecture: **Manipulating the inner surface of spherical shaped Mo₁₃₂ capsule and outer surface of Hadehog-shaped Mo₃₆₈ cluster.** AMMOA-2017, Held at IISER Kolkata, 9-10 May, 2017.
7. Oral Presentation: **43rd International Conference on Coordination Chemistry: ICC-2018**, Held at Sendai(JAPAN), 1-4 August, 2018
8. Oral Presentation: **International symposium on Metal-Oxo Cluster Sciences: Exploring Novel Possibilities, Held at Nihon University (JAPAN)**, 4-8 August, 2018
9. Invited Lecture: **National Conference on Advances in Spectroscopy: Molecules to Materials**, held at IITRAM Ahmedabad, (4-6 October 2018)
10. Invited Lecture: International Conference on Polymer Science and Technology (ICPST) held at **SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE (AUTONOMOUS), 9-10th March, 2021.**
11. Invited Lecture: Physiological Society of India conference held at Bankura Christian College, Bankura (18-20 November, 2022) Topic: Biological aspects of dioxygen.

Awards:

1. **ACS Best Poster Award at AMMOA-2017**, Held at IISER Kolkata, 9-10 May, 2017.
2. Appreciation by MHRD-New-Delhi, for designing new methodology for combating Covid- 19 in a competition called ‘Samadhan’

Awards by students:

Project Student Ms Moumita Patra received best poster award at IYPT-2019 held at Bankura Sammilani College, on 18-19 March 2019.

Convened National Conference: Celebrating International Year of Periodic Table (IYPT-2019) jointly organized by Bankura University and Bankura Sammilani College on 18-19 March 2019 (sponsored by Royal Society of Chemistry and Indian Chemical Society).

Other Interests:

- Playing and Enjoying Soccer.

Referees:

- 1) **Prof. Sankar Prasad Rath** (Thesis supervisor)
Department of Chemistry, IIT- Kanpur, UP-208016, India.
E-mail: sprath@iitk.ac.in
Tel: +91-512-2597251 Fax: +91-512-2597436 Web: <http://home.iitk.ac.in/~sprath/>
- 2) **Dr. Ranjan Patra**
Associate Professor,
Amity Institute of Click Chemistry Research & Studies
Amity University
E-mail: rpatra@amity.edu Tel: +91-8872444652