

CURRICULUM VITAE



DR. GOLAM MOULA

M.Sc., PH.D.

ASSISTANT PROFESSOR

(SINCE 21ST JANUARY, 2021)

DEPARTMENT OF CHEMISTRY

ANANDA CHANDRA COLLEGE

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Mailing Address: S/o- Prof. Abdul Moyed (Late), Murarai Nutan Bazar (On Mohespur Road, Near Madrasah), Murarai, Birbhum, West Bengal, India 731219

Gender/Nationality:

Male / Indian

EXPERIENCE

ETH Zurich, Switzerland

March, 2023 – Feb, 2025

Swiss National Science Foundation (SNSF) Fellow;

PI: Self

Project: 'Conversion of CO₂ into Value-added Chemicals or Fuels by Ni-Fe-S Clusters Active Site Mimics of the Bi-Functional Enzyme Carbon Monoxide Dehydrogenase / Acetyl Co-A Synthase (CODH/ACS)'

- Achieved A Super-Oxidized NiFe₃S₄ Cubanoid Derived from A Lithium-Capped All-Ferric Fe₃S₄ Cluster: Relevance to the NiFe Carbon Monoxide Dehydrogenase (CODH)

University of Calcutta, India

Sept, 2017 – Aug, 2019

National Post-doctoral Fellow (NPDF);

PI: Self

Project: 'Bio-inspired Catalysis of Water-gas-shift Reaction Using Assembled Metal Cluster'

- Developed bis-thiolated hydrosulfido copper complexes capable of dioxygen activation similar to formylglycine generating enzyme

Nagoya University, Japan

Apr, 2013 – Jun, 2017

Post-doctoral Fellow;

Advisor: Prof. Kazuyuki Tatsumi

Project: 'Biomimetic Synthetic Chemistry Relevant to Nitrogenase Iron Protein and P-Cluster'

- Achieved [Fe₈S₇(μ-S_{thiolate})₂] core of nitrogenase P^N-cluster which is the closest and best model till date to the native P-cluster core
- Synthesized [8Fe-7S] P-cluster model complexes in different form in terms of oxidation states, geometry and ligand environment
- Isolated an unprecedented all-ferric Fe₄S₄(STbt)₄ thiolate cluster, the only example of the cluster having [Fe₄S₄]⁴⁺ core with terminal thiolates
- Developed a hybrid iron-sulfur incomplete cubane in relevance to the proximal cluster of NiFe hydrogenase

Indian Institute of Technology (I.I.T.)

Kanpur, India

Aug, 2007 – Dec, 2012

Doctoral Fellow;

Advisor: Prof. Sabyasachi Sarkar

Dissertation: "Chemistry of the Entatic State of Mo in Molybdoenzymes and Ni, Fe Hydrogenases"

- Designed active sites for the oxidoreductase class of molybdenum enzymes, for example, structure-function model of the DMSO reductase family (TMANO reductase)
- Synthesized a nickel(II)-sulfur-based radical-ligand complex that mimicked the hydrogenase reaction and electro catalyzes hydrogen evolution at a low potential (-0.69 V)
- A Fe₄S₄ cluster was synthesized that showed interesting EPR spectrum which resembles with that observed with CO inhibited *Clostridium pasteurianum* W5 hydrogenase
- Involved in the synthesis of hetero-metallic complexes like FeW and WCu to investigate the electronic talking in between the metals
- Studied cyano molybdenum dithiolene complexes helped to understand the relatively complex magnetic coupling between metal centers

RESEARCH INTERESTS

- Structural and functional modeling of -
Nitrogenase
Hydrogenase
CO-dehydrogenases
Nitrous oxide reductase
Formylglycine Generating Enzyme
[Mn-Ca] oxide cluster for water oxidation
and several other metal reductases and oxidases
- Dioxygen activation chemistry of Cu and Fe complexes
- Synthesis of reactive organometallic complexes and activation of small molecules
- Transition metal chalcogenide chemistry
- Synthesis of magneto and photoluminescent organometallic materials

KEY SKILLS & ABILITIES

- Synthesis and spectral characterization (NMR, EPR, UV-Vis, Magnetism, Mossbauer, IR, fluorescence, mass spectrometric and electrochemical analyses) of inorganic and organic compounds
- Handling of air and moisture sensitive compounds using standard Schlenk line techniques and glove box
- Single crystal X-ray data collection and structural solution and analysis

- Handling of Cyclic-voltammetry, NMR, Mass, UV, IR-spectrometric machines for measurements
- Kinetics measurements and analysis of enzymatic reactions in model systems
- Density functional theoretical calculations

PUBLICATIONS

Publications as a postdoctoral researcher:

1. "Oxygen Activation by a Copper Complex with Sulfur-Only Coordination Relevant to the Formylglycine Generating Enzyme" **Golam Moula**, Jayanta Bag, Moumita Bose, Souvik Barman, Kuntal Pal; *Inorg. Chem.* **2022**, *61*, 6660-6671. <https://doi.org/10.1021/acs.inorgchem.2c00746>
2. "Synthesis of A Nitrogenase P^N-Cluster Model with [Fe₈S₇(μ-S_{thiolate})₂] Core from the All-ferric [Fe₄S₄(S_{thiolate})₄] Cubane Synthron" **Golam Moula**, Ayaka Nagasaki, Tsuyoshi Matsumoto, Matthias E. Miehlich, Karsten Meyer, Roger E. Cramer, and Kazuyuki Tatsumi; *Angew. Chem. Int. Ed.* **2021**, *60*, 15792-15797 (<https://doi.org/10.1002/anie.202102369>); *Angew. Chem.* **2021**, *133*, 15926-15931 (<https://doi.org/10.1002/ange.202102369>). {Selected as *Hot Paper* and also selected as Journal frontispiece: *Angew. Chem. Int. Ed.* **2021**, *60*, 15792 (<https://doi.org/10.1002/anie.202182961>); *Angew. Chem.* **2021**, *133*, 15926 (<https://doi.org/10.1002/ange.202182961>)}.
3. "Synthesis of an All-Ferric Cuboidal Iron-Sulfur Cluster [Fe^{III}₄S₄(SAR)₄]" **Golam Moula**, Tsuyoshi Matsumoto, Matthias E. Miehlich, Karsten Meyer, and Kazuyuki Tatsumi; *Angew. Chem. Int. Ed.* **2018**, *57*, 11594-11597 (<https://doi.org/10.1002/anie.201803679>); *Angew. Chem.* **2018**, *130*, 11768-11771 (<https://doi.org/10.1002/ange.201803679>). (Selected as *Very Important Paper* and also selected as Journal Inside Cover: *Angew. Chem. Int. Ed.* **2018**, *57*, 11474 (<https://doi.org/10.1002/anie.201806879>); *Angew. Chem.* **2018**, *130*, 11646 (<https://doi.org/10.1002/ange.201806879>)}.
4. "Chemistry of the nitrogenase P-cluster: Structural and electronic flexibility" **Golam Moula**, and Kazuyuki Tatsumi; *Abstracts of Papers of The American Chemical Society* 254
5. "Graphene Supported Rhodium Nanoparticles for Enhanced Electrocatalytic Hydrogen Evolution Reaction" Ameerunisha Begum, Moumita Bose, and **Golam Moula**; *Scientific Reports* **2019**, *9*, 17027. <https://doi.org/10.1038/s41598-019-53501-x>.
6. "Fe₄S₄ Cubane Type Cluster Immobilized on a Graphene Support: A High Performance H₂ Evolution Catalysis in Acidic Water" Ameerunisha Begum, Aasif Hassan Sheikh, Golam Moula, and Sabyasachi Sarkar; *Scientific Reports* **2017**, *7*, 16948. <https://doi.org/10.1038/s41598-017-17121-7>.

Publications from Ph.D.:

7. "Structurally characterized one oxo–desoxo bridged Mo₂–bis(dithiolene) complex and its interconversion to a discrete oxo or desoxo DMSOR model" **Golam Moula**, Moumita Bose, and Sabyasachi Sarkar; *New. J. Chem.* **2019**, *43*, 8332-8334. <https://doi.org/10.1039/C9NJ01020C>
8. "Synthesis and Characterization of Cyano and Isocyano Complexes of Bis(dithiolato) Molybdenum Using Me₃SiCN: A Route to a Cyanide Bridged Multimer to Monomer" Moumita Bose, Golam Moula, Ameerunisha Begum, and Sabyasachi Sarkar; *New. J. Chem.* **2018**, *42*, 5580-5592. <https://doi.org/10.1039/C8NJ00246K>
9. "A Cyanide Bridged Molybdenum(bis-maleonitrile dithiolated) Square" Moumita Bose, Golam Moula, and Sabyasachi Sarkar; *Inorg. Chem.* **2014**, *53*, 6-8. <https://doi.org/10.1021/ic402160h>
10. "Replica of a Fishy Enzyme: Structure – Function Analogue of Trimethylamine N-Oxide Reductase" **Golam Moula**, Moumita Bose, and Sabyasachi Sarkar; *Inorg. Chem.* **2013**, *52*, 5316-5327. <https://doi.org/10.1021/ic4002576>
11. "Electronic Structure of Monodithiolated Iron-Oxotungsten Heterometallic Complexes: Integer-Spin Fe-W Assembly" Moumita Bose, **Golam Moula**, and Sabyasachi Sarkar; *Chemistry-An Asian Journal* **2013**, *8*, 1128-1138. <https://doi.org/10.1002/asia.201300245>
12. "Photoluminescent Mo(IV) and W(IV) Bis-dithiolene Complexes with Bidentate Phosphonodithioato Ligand Derived from Lawesson's Reagent" **Golam Moula**, Moumita Bose, Harashit Datta, and Sabyasachi Sarkar; *Polyhedron* **2013**, *52*, 900-908. <https://doi.org/10.1016/j.poly.2012.07.024>
13. "Oxomolybdenum monodithiolene complexes linked with sulfur bridged iron: antiferromagnetically coupled Fe(III)Mo(V) systems". **Golam Moula**, Moumita Bose, Biplab K. Maiti, and Sabyasachi Sarkar; *Dalton Trans.* **2012**, *41*, 12926-12935. <https://doi.org/10.1039/C2DT31743E>
14. "Super reduced Fe₄S₄ cluster of Balch's dithiolene series". Ameerunisha Begum, **Golam Moula**, Moumita Bose, and Sabyasachi Sarkar; *Dalton Trans.* **2012**, *41*, 3536 – 3540. <https://doi.org/10.1039/C2DT12184K>
15. "Mono(maleonitriledithiolene)molybdenum(IV) and Bis(μ-sulfido)bridged Dimolybdenum(V) Complexes with Mo=S Moiety" Moumita Bose, **Golam Moula**, and Sabyasachi Sarkar; *Chemistry & Biodiversity* **2012**, *9*, 1867 – 1879. <https://doi.org/10.1002/cbdv.201100450>
16. "Dangling Thiyl Radical: Stabilized in [PPh₄]₂[(bdt)W^{VI}(O)(μ-S)₂Cu^I(SC₆H₄S*)]" Moumita Bose, **Golam Moula**, Ameerunisha Begum, and Sabyasachi Sarkar; *Inorg. Chem.* **2011**, *50*, 3852 – 3854. <https://doi.org/10.1021/ic200258u>
17. "A Nickel(II)–Sulfur–Based Radical-Ligand Complex as a Functional Model of Hydrogenase". Ameerunisha Begum, **Golam Moula**, and Sabyasachi Sarkar; *Chem. Eur. J.* **2010**, *16*, 12324 – 12327. <https://doi.org/10.1002/chem.201001812>

WORKS IN PROGRESS

1. "A Hybrid Iron-Sulfur Incomplete Cubane Cluster Derived from the Unprecedented All-Ferric $\text{Fe}_4\text{S}_4(\text{SAr})_4$ Cluster" **Golam Moula**, Moumita Bose, Tsuyoshi Matsumoto, and Kazuyuki Tatsumi (To be Submitted).
2. "Synthesis and Characterization of An Oxidized P-Cluster Model Complex and its Conversion to the Reduced Form" with Prof. Kazuyuki Tatsumi (Under Preparation).
3. "A Super-Oxidized NiFe_3S_4 Cubanoid Derived from A Lithium-Capped All-Ferric Fe_3S_4 Cluster: Relevance to the NiFe Carbon Monoxide Dehydrogenase (CODH)" from ETH Zurich (To be Submitted)

RESEARCH PROJECTS

- Principal Investigator: National Post Doctoral Fellowship (NPDF) Project, DST-SERB, Government of India
File Number: PDF/2017/000062
Date: 11/07/2017
Funding: ₹19,20,000/-
Duration: 2017–2019 (2 years)
- Principal Investigator: Start-Up Research Grant (SRG), SERB, Government of India
File Number: SRG/2022/001158
Date: 23/08/2022
Funding: ₹33,00,000/-
Duration: Approved for 2022–2024 (2 years), not accepted due to prior commitments to SNSF at ETH Zurich
- Principal Investigator: Swiss National Science Foundation (SNSF) Fellowship, ETH Zurich
Grant Number: TMPFP2_210632
Date: 17/06/2022
Funding: CHF 2,96,600/-
Duration: 2023–2025 (2 years)
Note: Equivalent to a Marie Curie Fellowship, as Switzerland was not part of the EU during the grant period

POSTERS/WORKS PRESENTED

| <i>Title of the Poster presented</i> | <i>Name, Venue and Date of the Symposia</i> |
|---|---|
| Electronic and Geometric Flexibility of Iron-Sulfur Clusters: Relevance to the Nitrogenase Active Sites | 19 th International Conference on Biological Inorganic Chemistry (ICBIC 19) University of Zurich, Interlaken, Switzerland August 11 th -16 th , 2019 |
| Chemistry of the nitrogenase P-cluster: Structural and electronic flexibility | 254 th ACS National Meeting & Exposition Washington, DC, USA August 20-24 th , 2017 |
| Stereo-Electronic Flexibility of Iron-Sulfide Clusters Relevant to the Active Sites of Nitrogenase | 8 th Asian Biological Inorganic Chemistry Conference (AsBIC8) The University of Auckland, New Zealand December 4 th -9 th , 2016 |
| A Novel All-Ferric [4Fe-4S] Cluster Having Bulky Tbt Thiolates | The 66 th Conference of Japan Society of Coordination Chemistry (JSCC 66) Fukuoka University, Fukuoka, Japan September 10 th -12 th , 2016 |
| An Optimal P-Cluster Model of Nitrogenase having Sterically Demanding Thiolates | The 5 th International Conference on MEXT Project of Integrated Research on Chemical Synthesis "Chemical Science for Future Societies" Noyori Materials Science Laboratory, Nagoya University, Nagoya, Japan January 29 th -30 th , 2016 |
| Synthesis of [8Fe-7S] Clusters Having Sterically Demanding Thiolates: An Optimal P-Cluster Model of Nitrogenase | The 65 th Conference of Japan Society of Coordination Chemistry (JSCC 65) Nara Women's University, Nara, Japan September 21 st -23 rd , 2015 |

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| Triplet State and Temperature Independent Paramagnetism in an Asymmetric Mo(IV) Dimer | 15 th International Conference on Biological Inorganic Chemistry (ICBIC 15) University of British Columbia, Vancouver, BC August 7 th -12 th , 2011 |
| Oxomolybdenum Dithiolene Moiety Stabilized by Iron-Thiolate | 15 th International Conference on Biological Inorganic Chemistry (ICBIC 15) University of British Columbia, Vancouver, BC August 7 th -12 th , 2011 |

AWARDS & FELLOWSHIPS

- Swiss National Science Foundation (SNSF) Fellowship, Switzerland August, 2022
- National Post-Doctoral Fellowship (NPDF) from Department of Science and Technology (DST), India July, 2017
- Senior Research Fellow (SRF) from Council of Scientific and Industrial Research (CSIR), India Aug, 2009
- Junior Research Fellow (JRF) from Council of Scientific and Industrial Research (CSIR), India Aug, 2007
- Qualified Graduate Aptitude Test in Engineering (GATE) from Ministry of Human Resource & Development (MHRD), India Feb, 2007
- Qualified National Eligibility Test (NET) from Council of Scientific and Industrial Research (CSIR), India Dec, 2006
- Qualified Graduate Aptitude Test in Engineering (GATE) from Ministry of Human Resource & Development (MHRD), India Feb, 2005

TEACHING EXPERIENCE

- *Department of Chemistry, I.I.T. Kanpur: Teaching assistant; taught two courses (CHM 101 theoretical and practical inorganic chemistry) for three semesters at the graduate level during my Ph.D.*
- *Guided few M.Sc. students from I.I.T. Kanpur for their compulsory six months project and*
- *Also guided few students other than I.I.T. Kanpur who came to pursue project under SURGE (Summer Undergraduate Research Grant for Excellence) program.*
- *Department of Chemistry, Ananda Chandra College: Assistant Professor; since 21st January, 2021*

Declaration: I hereby declare that the particulars furnished herein by me are true to the best of my knowledge and belief.

Golam Moula
(Golam Moula)