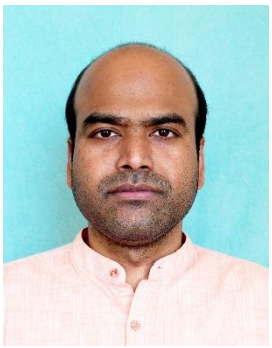
CURRICULUM VITAE

DR. MULLAH MUHAIMINUL ISLAM, *M.Sc., Ph.D.*

Vill.: Mandia Gaon
P.O.: Mandia
Dist.: Barpeta (Assam)
Country: India
Pin code: 781308
Email: islammuhai85@gmail.com
Mobile No.: +917099065608, +919402300332



Carrier Objectives:

- To work in assigned position with steady and peaceful mind. I will try my best in utilizing my knowledge and skills to keep adding values to the position I will be representing. Simultaneously, I will provide my upmost service for the overall development and profitability of the environment. During doing so I will keep updating my skills and knowledge simultaneously in providing my better service.

Personal Information:

S/O.: Late Kitab Ali Ahmed & Naytan Nessa

Permanent Address: Vill.: Mandia Gaon, P.O.: Mandia, Dist.: Barpeta (Assam), India. PIN. 781308

DOB: 31st December 1983; **Sex:** Male; **Marital Status:** Married

Nationality: Indian; **Passport Number:** P3947399

Academic Background:

2017: Doctor of Philosophy (Ph.D.) in Chemistry, North-Eastern Hill University, Shillong-22, Meghalaya, India.

2011: M.Sc. in Chemistry, North-Eastern Hill University, Shillong-22, Meghalaya, India.

2009: B.Sc. University of Gauhati, Guwahati-781014, Assam, India.

Major Course: Chemistry.

Pass Courses: Mathematics & Physics.

Title of the Ph.D. thesis: **Fluorescence Based Studies on Drug-Receptor Interaction: Characterization of Acetylcholinesterase Inhibitors.**

Supervisor: ***Prof. Sivaprasad Mitra***, Professor, North-Eastern Hill University, Shillong-793022, Meghalaya, India. (Email: smitranehu@gmail.com & smitra@nehu.ac.in)

Achievements:

2013, June: NET-LS, CSIR, New Delhi-110012, India; ***Subject:*** *Chemical Sciences.*

2013, December: NET-LS, CSIR, New Delhi-110012, India; ***Subject:*** *Chemical Sciences.*

Area of Research:

- Biochemical assay, whole cell assay, enzyme kinetics, enzyme inhibition kinetics, monitoring in-vitro enzyme activity in various biocompatible environments.

- Live cell imaging, enzyme trafficking in live cell, molecular cloning, DNA vector construction, protein extraction & purification (both in cell and cell free system), RNA synthesis and purification, evaluation of protein-RNA binding interaction, tagging of organic fluorophore to biomolecules.
- Protein-protein interaction, drug-protein interaction, biomolecules-ionic liquids interaction, DNA-ligand interaction; investigating the role of surfactants (including bile acids), cyclodextrins and nanoparticles on structure and activity of biomolecules & bio-conjugated systems.
- Excited state dynamics of fluorophores including proton transfer, charge transfer systems; solvation dynamics; photophysical characterization of inclusion complexes; time resolved spectroscopic investigation of micro heterogeneous media; photochemistry of organic biomolecules, caging and decaging of photo labile small organic molecules.

Research Experience:

01 /09 /2021 to 31/08/2023: Eu Postdoctor (Marie-Curie Fellow), Department of Chemistry and Molecular Biology, University of Gothenburg, **Sweden**.

01 /11 /2019 to 31 /08 /2021: Institute Postdoctoral Fellow, Department of Applied Chemistry, Shibaura Institute of Technology, Toyosu campus, Tokyo, **Japan**.

11 /09 /2017 to 10 /09 /2019: National Postdoctoral Fellow (N-PDF), School of Chemical Sciences, National Institute of Science Education and Research (NISER), Bhubaneswar, Odisha, **India**.

Awards / Prize Winner:

2022: "AICPERT Academic Excellence Awards-2022 for Best Young Scientist", All India Council for Productive Education, Research and Training (AICPERT), Aligarh is an affiliated body of Vigyan Prasar, Department of Science and Technology (DST), **Govt. of India**.

2021: "Winner of Best Poster Prize" in NPDF Poster Competition 2021, India organised by Science and Engineering Research Board-American Chemical Society (SERB-ACS) Publications.

Prestigious Funding Fellowships Received:

2021: **"**Marie Skłodowska-Curie (MSC) Fellowship", an international fellowship funded by European Commission of Research Executive Agency, *project number 101030684*.

2017: **"**National Post-Doctoral Fellowship (N-PDF)", a national fellowship funded by Science & Engineering Research board (SERB), **Govt. of India**. *File number PDF/2017/001547*.

2013: **"**Maulana Azad Junior Research Fellowship (MAN-JRF)" to pursue Ph.D. Degree, a national fellowship funded by University Grant Commission (UGC), New Delhi-110002, **Govt. of India**. *File number F1-17.1/2013-14/MANF-2013-14-MUS-ASS-20162 /(SA-III/Website)*.

Technical Skills:

- **Instrumentals:**

  Florescence microscope, time-resolved confocal microscope, multimode microplate reader, time-resolved spectrofluorometer (strobe and TCSPC set up), steady-state spectrofluorometer, LASER controller, polarizer & temperature controller (both in steady-state & time-resolved spectrofluorometer), UV-Vissible spectrophotometer, LED array controller (both cuvette and microplate based), circular dichroism (CD) spectrometer, isothermal titration calorimeter (ITC), dynamic light scattering (DLS) spectrometer, electrochemical workstation, HPLC, metal ion affinity chromatography, gel filtration chromatography, flash chromatography, gel electrophoresis, lyophilizer, centrifuge-machine, rotary evaporator, ultrasonicator, conductometer.

- **Laboratory:**

  Spectroscopy lab., molecular biology lab., handling both bacterial and live cells, DNA, RNA, proteins, ionic liquids (ILs), surfactants, bile acids, bioactive small molecules, drugs, photolabile molecules etc.

- **Computer:**

Operating systems:	Windows11, Windows 10, Windows 8.1, Windows 8, Windows 7, Windows XP, Windows98, Linux.
Software:	Gaussian 09, Origin 2023, Origin 2022, Microcal Origin 6.0 Professional, GraphPad Prism7, Igor Pro, GROWMACS, Autodock Vina, Autodock Tools, Chimera, Chem-draw Ultra, PyMol, Adobe Photoshop, MS Office-2021, End Note, etc.
Web Server:	SciFinder, mfold.

Language Skills:

Assamese ; **Bengali** ; **English** ; **Hindi**

Country Visited:

Denmark (Copenhagen) ; **France** (Paris) ; **Japan** (Tokyo) ; **Sweden** (Gothenburg)

Researcher Account:

Google Scholar ID:	https://scholar.google.co.in/citations?hl=en&user=gfajeOYAAAAJ
Web of Science Researcher ID:	JXL-5527-2024
Orcid ID:	Org/0000-0003-2160-3006
Scopus ID:	55880333900

Summary of work done during Ph.D.:

- The clear mechanism of cholinergic drug induced quenching of acetylcholinesterase (AChE) bound thioflavin-T (ThT, a cationic organic dye) fluorescence has been explained by various experimental techniques along with molecular modelling approach. The resulting modulation in steady state intensity and/or time-dependent fluorescence depolarization forms the basis of a molecular switch between ThT and inhibitors. Finally, molecular switch based high throughput fluorescence assay protocol has been designed for AChE inhibitors.
- The enzymatic activity of AChE has been carried out in presence of two well-known intercalating agents (ethidiumbromide, EB and propidium iodide, PI) in aqueous buffer. Kinetic mechanism of enzyme inhibition by intercalating agents and the comparative effectiveness of inhibition have been studied in detail. Inhibition activity of both EB and PI has also been studied in bile acids (BAs) (cholic acid (CA), deoxycholic acid (DCA) and chenodeoxycholic acid (CDCA)) and in physiological range of human serum albumin (HSA) matrix. Comparatively less inhibition efficacy of both the agents in BA medium in comparison with albumin matrix obtained from the study signifies to take the importance for choosing the route of administration of AD drugs to get optimum response.
- The inhibition activity of some well-known AD drugs towards AChE have been studied in aqueous buffer as well as in physiological range of HSA medium. The results are justified by molecular docking simulation results. The novelty of the work is that the reduced inhibition activity of all the studied drugs in HSA matrix can be used as a pre-ADME screen for developing effective, nontoxic and potent drugs against various macromolecular targets implicated in AD.
- Binding interaction of some selective short acting antibacterial as well as psychoactive stimulant drugs with circulatory proteins like Bovine serum albumin (BSA), HSA and Lysozyme (LYS) enzyme have been investigated by exploiting-steady state and time-resolved fluorescence techniques. Thermodynamic justification of binding interactions has been explained in detail by carrying out temperature dependent spectrofluometric titration experiments. Locations of drugs in the protein binding sites has also been described by performing molecular docking simulation.
- The effect of synthesized nano particles (NPs) on some selective enzyme-drug interaction processes have been investigated by exploiting steady-state and time resolved fluorescence along with TEM imaging and DLS techniques. Effect of NP on enzyme activity has also been studied by broth culture-antibacterial assay method and special enzyme activity kit assay method.
- Photophysical studies of synthesized functionalized [1,6] naphthyridines and commercially available organic dyes have been performed in homogeneous (both pure and mixed) solvents as well as some biologically relevant

surfactants by exploiting steady-state and time-resolved fluorescence techniques. From titration experiment of surfactants against dye solution, we have been able to evaluate the critical micelle concentration (cmc) of various surfactants with time-resolved fluorescence data.

Brief outline about the work done in MSCA-IF project:

The REarranged during Transfection (RET) receptor tyrosine kinase is a protein kinase, plays important roles in regulating cellular proliferation, migration, and survival in the normal development of neural crest derived tissues. Furthermore, aberrant activation of RET, through oncogenic mutations or overexpression, can contribute to tumorigenesis, regional invasion, and metastasis of several human cancers. RET relocalisation plays a role in cancer invasion and metastasis. Unfortunately, the detailed understanding of RET's dynamic function and the importance of quantitative, spatial and time-dependent parameters regarding RET trafficking is lacking. As such, the ability to manipulate RET activity using light would result in temporal control of enzymatic activity, thus serving as a valuable approach to probe the RET trafficking, further our understanding of cell movement and invasion. Keeping in mind the aforementioned point, in this project, it was being tried to develop an experimental setup that could be applied to understand the important role of intracellular and dynamic RET trafficking in cell motility, migration, and invasion. The objective of the research was to combine PRETIs (especially selective to RET kinase), those could be turned *on* in presence of light, with imaging to monitor RET trafficking with unprecedented spatiotemporal resolution. First, a PRETI was designed and synthesised by installing a coumarin photocaged group on to the functional part of RET selective kinase inhibitor, pralsetinib. The PRETI was then purified and characterised by conventional techniques. Initially, a series of photophysical experiments was performed to validate the use of PRETI. Then the PRETI was validated by performing a biochemical and a whole cell assay (ADP-Glo™ RET kinase assay and NanoBRET intracellular RET kinase assay respectively). For monitoring RET trafficking, cells were exposed to PRETI that can be turned *on* and with light. Their effects on RET trafficking were monitored by imaging. The results of these studies provided new insights into intracellular RET trafficking and its role in cancer, ultimately leading to new therapeutic targets and improved disease management.

Brief outline about the work done during SIT Post-Doctoral Period:

Title: **Hetero protein assemblies on the hetero hairpin RNA dock enable hyper efficient serial processing.**

Summary:

Proper orientation of receptor molecule plays a vital contributing factor for various bio catalytic reactions. Here, we would like to postulate that studies on RNA-peptide interaction with multiple loops containing hairpin RNA can provide a fascinating model system to place hetero protein assemblies on a specific order that eventually enhance the reaction process by facing enzymes each other in order to the reaction process. Keeping the above points in mind, in the current project, triple loop TAR-RRE-sc1 RNA was chosen with the objective to place Tat, RRE and RGG box peptides sequentially on the RNA loop. For the purpose, there fluorescent proteins (FPs) of which having the RNA binding anchor peptide was synthesized and purified. These FPs are Tat anchored cyan fluorescent protein (CFP), Rev anchored yellow fluorescent protein (YFP) and RGG box anchored red fluorescent protein (RFP). Initially, plasmid vector of respective protein system was constructed in HAT20 vector by employing In-Fusion cloning technology. Later, proteins were expressed by transfecting the plasmid vector into E.Coli cells (ECOS SONIC BL21 (DE3)), and then extracted them by cultivating the cells in LB medium for overnight. Extracted proteins were purified by using conventional bioanalytical tools. The purity of the proteins was checked by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE). The secondary structure of the TAR-RRE-sc1 RNA was optimised in UNAfold (mfold web server). Then, the RNA was synthesised by using the conventional transcription protocol using appropriate template and complement sequences. The RNA was then purified by conventional bioanalytical protocols and the purity was confirmed by polyacrylamide gel electrophoresis (PAGE). Firstly, the binding interaction between proteins and the RNA was evaluated individually with mono protein cases. Secondly, the binding interaction was evaluated with dual protein and finally with triple protein cases. The techniques used in evaluating binding interactions are UV-vissible absorption, both steady-state and time resolved fluorescence and electrophoretic mobility shift assay. FRET based experiment was exploited to evaluate sequential binding interaction between RNA and dual protein and finally that with triple protein system. The comprehensive and quantitative picture arises from these studies entails a significant step forward for sequential mooring of hetero protein assembly on multiple loops containing hairpin RNA. The result of this study was expected to provide a new strategy that would be useful in synthetic biology oriented some production process.

Brief outline about the work done during N-PDF:

Title: **Understanding the Interaction between Biomolecules and Ionic Liquids by exploiting Steady-State Absorption and Fluorescence, Time-Resolved Fluorescence and Fluorescence Correlation Spectroscopy (FCS) studies.**

Summary:

The aim of the project was to investigate the binding interaction of numerous biological macromolecules like proteins, DNA etc. with ionic liquids (ILs) having different alkyl chain length on both the anionic as well as cationic moieties of the IL and with several dicationic ILs (DILs). The intention of the work was to realise the structural behaviour of bio macromolecules in a variety of structurally similar series of ILs subsequently generalize the friendliest set of ILs for retaining the structure of biomacromolecules. The interactions studies were investigated at both ensemble level and single molecule level. Several spectroscopic techniques were implemented to achieve the objectives. Specifically, the studies were implemented on several monocationic ILs (MILs) having different hydrophobic alkyl groups on the cationic moiety and dicationic imidazolium ILs having different alkyl spacer. Secondary structural modulation of biomolecules (proteins, DNA) induced by ILs was also investigated in this work. Molecular level scenario of the interactions was also outlined computationally with the help of molecular docking approach. The study on bovine serum albumin (BSA) protein points that the alkyl chain length on the cationic imidazolium moiety of ILs plays an important role in the protein-IL interaction. This study essentially indicates the optimum hydrophobic character of the ILs that is necessary to induce protein-IL interaction and consequently the denaturation of the protein structure. However, in a different study on lysozyme protein, it has been observed that protein-IL interaction with structurally similar MILs and DILs is very different. As compared to MILs, the influence of DIL toward protein is observed to be significantly less in terms of change in the structure and dynamics of protein. The conclusion of this study essentially demonstrates that DILs can be better media over MILs for retaining the native structure of protein. The outcome of the investigation of this proposed project is expected to be accommodating to increase the understanding of peptide-IL, protein-IL, DNA-IL interactions, which would be significantly helpful in peptide chemistry, biochemistry as well as in drug development applications. Moreover, result of this study is helpful in selecting suitable ILs with appropriate constituent cations for their potential applications in protein and DNA technologies.

List of Publications:

1. **M. M. Islam**, S. Barik, N. Preeyanka, M. Sarkar*, Interaction of lysozyme with monocationic and dicationic ionic liquids: Toward finding a suitable medium for biomacromolecules, *J. Phys. Chem. B, 124* **(2020)** 961-973.
2. **M. M. Islam**, S. Barik, M. Sarkar*, Probing the interactions of 1-alkyl-3-methylimidazolium tetrafluoroborate (alkyl = octyl, hexyl, butyl, and ethyl) ionic liquids with bovine serum albumin: an alkyl chain length-dependent study, *J. Phys. Chem. B*, *123* **(2019)** 1512-1526.
3. **M. M. Islam**, M. A. Rohman, A. B. Gurung, A. Bhattacharjee, K. Aguan, S. Mitra*, Correlation of cholinergic drug induced quenching of acetylcholinesterase bound thioflavin-T fluorescence with their inhibition activity, *Spectrochim. Acta, Part A, 189* **(2018)** 250-257.
4. V. K. Sonu, **M. M. Islam**, A. B. Gurung, A. Bhattacharjee, S. Mitra*, Serum albumin interaction with xanthine drugs at nano–bio interfaces: A combined multi-spectroscopic and molecular modelling approach, *J. Mol. Liq., 242* **(2017)** 919-927.
5. **M. M. Islam**, S. Mitra*, Cholinergic inhibitors replace thioflavin-T from acetylcholinesterase binding pocket: A potential fluorescence based molecular switch, *Chem. Phys. Letts.*, *664* **(2016)** 63-69.
6. S. Nandi, **M. M. Islam**, S. Mitra, A. K. Pal*, Regioselective synthesis of functionalized [1, 6] naphthyridines by KF/basic alumina as a recyclable catalyst and a brief study of their photophysics, *Synth. Commun., 46* **(2016)** 1461-1476.
7. V. K. Sonu, **M. M. Islam**, M. A. Rohman, S. Mitra*, Lysozyme binding ability toward psychoactive stimulant drugs: Modulatory effect of colloidal metal nanoparticles, *Colloids Surf., B,* 146 **(2016)** 514-522.
8. **M. M. Islam**, K. Aguan, S. Mitra*, Fluorescence properties and sequestration of peripheral anionic site-specific ligands in bile acid hosts: Effect on acetylcholinesterase inhibition activity, *J. Photochem. Photobiol. B., 158* **(2016)** 192-201.
9. **M. M. Islam**, A. B. Gurung, A. Bhattacharjee, K. Aguan, S. Mitra*, Human serum albumin reduces the potency of acetylcholinesterase inhibitor-based drugs for Alzheimer's disease, *Chem–Biol. Interact.*, *249* **(2016)** 1-9.

10. **M. M. Islam**, V. K. Sonu, P. M. Gashnga, N. S. Moyon, S. Mitra*, Caffeine and sulfadiazine interact differently with human serum albumin: A combined fluorescence and molecular docking study, *Spectrochim. Acta, Part A, 152* **(2016)** 23-33.
11. **M. M. Islam**, N. S. Moyon, P. M. Gashnga, S. Mitra*, Interaction of sulfadiazine with model water-soluble proteins: A combined fluorescence spectroscopic and molecular modelling Approach, *J. Fluoresc.*, *24* **(2014)** 579-588.
12. N. S. Moyon, **M. M. Islam**, S. Phukan, S. Mitra*, Fluorescence modulation and associative behaviour of lumazine in hydrophobic domain of micelles and in bovine serum albumin, *J. Photochem. Photobiol. B., 121* **(2013)** 37-45.

Seminar /Workshop Attended:

1. **International Chemical Congress of Pacific Basin Societies Virtual Congress**, December 16-21, **2021** (Poster Presented).
2. **Science and Engineering Research Board American Chemical Society Publications: NPDF Poster Competition 2021, India,** March 2021 (Poster Presented).
3. National Symposium on **Emerging Trends in Chemistry (ETC–2016)**, March 28-29, **2016** in NEHU Shillong-22 (Participation).
4. An International Symposium on **Recent Advances in Chemistry (REACH-2015)**, March 03-05, **2015** in NEHU Shillong-22 (Poster Presented).
5. National seminar, **"Newer Trends in Chemistry and Environment"**, December 10-14, **2014** in Don Bosco College Tura (Oral Presentation).
6. **National Symposium on Sustainable Chemistry: Frontiers & Challenges (SCFC-2014)**, February 27–March 01, **2014** in NEHU Shillong-22 (Poster Presented).
7. **Trombay Symposium on Radiation & Photochemistry (TSRP-2014)**, January 06-09, **2014** in BARC Mumbai (Poster Presented).
8. **National Fluorescence workshop (FCS 2013)**, November 24-28, **2013** in IISc and JNCASR Bangalore (Poster Presented).
9. **National Symposium on Radiation and Photochemistry 2013 (NSRP-13)**, March 20-22, **2013** in NEHU Shillong-22 (Participation).
10. **National Fluorescence workshop (FCS 2012) Fluorescence Methods in Single Molecule Spectroscopy**, December 03-07, **2012** in SINP and IICB, Kolkata (Participation).

Reference Persons:

1. **Prof. Sivaprasad Mitra,** Professor, UGC Centre for Advanced Studies in Chemistry, North-Eastern Hill University Shillong-793022, **India**, Email: smitranehu@gmail.com
2. **Dr. Moloy Sarkar,** Associate Professor, School of Chemical Sciences, NISER, Bhubaneswar, Khurda-752050, Odisha, **India**, Email: msarkar@niser.ac.in
3. **Prof. Morten Grøtli,** Professor, Department of Chemistry and Molecular Biology, University of Gothenburg, Kemivägen 10, SE-41296, Gothenburg, **Sweden**, Email: grotli@chem.gu.se
4. **Prof. Keita Hamasaki,** Professor, Department of Applied Chemistry, Shibaura Institute of Technology, Toyosu Campus, Tokyo 135-8548, **Japan**, Email: hamie@shibaura-it.ac.jp

Mullah Muhaiminul Islam

03 /07 /2024