

Rashid Mia, Ph.D.

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Department of Chemistry & Biochemistry
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EDUCATION

- | | |
|-------------|--|
| 2016 – 2021 | Doctor of Philosophy (Ph.D.)
Major: Inorganic and Supramolecular Chemistry
Advisor: Karl J. Wallace
University of Southern Mississippi, Hattiesburg, MS, USA. |
| 2012 – 2014 | Masters of Science (MS)
Major: Chemistry
University of Dhaka, Dhaka, Bangladesh. |
| 2008 – 2012 | Bachelors of Science (BS)
Major: Chemistry
University of Dhaka, Dhaka, Bangladesh. |

PROFESSIONAL EXPERIENCES

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| Aug. 2022 – Current | Assistant professor , Stephen F. Austin State University, Nacogdoches, TX. |
| Jan. 2022-Aug. 2022 | Postdoctoral Research Associate , University of Southern Mississippi. |
| Aug. 2019-Dec. 2021 | Graduate Research Assistant , University of Southern Mississippi. |
| Aug. 2016-Jul. 2019 | Graduate Teaching Assistant , University of Southern Mississippi. |

RESEARCH INTEREST

Design and synthesis of portable Chemosensors (fluorescent probes) and deployed them to detect biologically and environmentally important toxic analytes; for instance, chemical warfare agents (nerve agents, organophosphates), toxic metals and anions. Research area includes but not limited to Inorganic and Supramolecular chemistry, organic & inorganic synthesis, structure elucidation (NMR, Mass spec, IR), coordination chemistry, host-guest chemistry, self-assembly, optical Spectroscopy (UV-vis, Fluorescence, Phosphorescence).

RESEARCH EXPERIENCES

PUBLICATIONS

A. Published peer-reviewed journal articles

1. **Rashid Mia**, Peter J. Cragg, Frank R. Fronczek, and Karl J. Wallace.; *Killing Two Birds with One Stone: Simultaneous Phosphorylation of a Tabun Mimic and Capture of Phosphorylated Cyanide Ions Using a Single Fluorescent Chemodosimeter*. (**New Journal of Chemistry**, **2022**,**46**, 21278-21286)
2. **Rashid Mia**, Peter J. Cragg, and Karl J. Wallace.; *Low Molecular Weight Fluorescence Probes for the Detection of Organophosphates*. **Journal of Luminescence** **2021**, 235, 118053.
3. Aaron B. Davis, Michael H. Ihde, Alie M. Mallet, Dana L. Davis, **Rashid Mia**, Jessica Panella, Frank R. Fronczek, Marco Bonizzoni, and Karl J. Wallace.; *Structural Features of a family of Coumarin-enamine Fluorescent Chemodosimeters for Ion-pairs*. **Inorganic Chemistry**, **2021**, 60, 18, 14238–14252.
4. Amer Dawoud, **Rashid Mia**, Arati Biswakarma, Jesy Motchaalangaram, Wujian Miao, and Karl J. Wallace.; *Embedded Electrochemistry with a Miniaturized, Drone-Based, Potentiostat System for Remote Detection Chemical Warfare Agents*. **International Journal of Aerospace and Mechanical Engineering**, **2022**, 16, 112-115.
5. Amer Dawoud, **Rashid Mia**, Wujian Miao, and Karl J. Wallace.; *Embedded Electrochemistry with a Miniaturized, Drone-Based, Potentiostat System for Remote Detection of DFP (manuscript is under review)*.

B. Manuscript to be submitted in peer-reviewed journal

6. **Rashid Mia**, Arati Biswakarma, Wujian Miao, Peter J. Cragg, Frank R. Fronczek and Karl J. Wallace.; *An ECL-chemodosimeter for the detection of DFP- a sarin mimic*. (Manuscript ready, will submit to **Analyst**)
7. **Rashid Mia**, Peter J. Cragg, Frank R. Fronczek, and Karl J. Wallace. *Multi-chromophoric Pillar[5]arene Fluorescent Molecular Cage for Al³⁺*. (Manuscript in preparation, will submit to **Inorganic Chemistry**).
8. **Rashid Mia**, Iyanuoluwani Owolabi, Alex Flynt and Karl J. Wallace. *Coumarin-quinoline derivatives for Zn²⁺ detection in HKD cell*. (Manuscript in preparation, will submit to **Organic & Biomelecular Chemistry**).

C. Presentation & Conferences

1. **Rashid Mia**, Wallace, K. J. *An ECL-Chemodosimeter to Detect DFP – a Sarin Mimic*, ISMSC 2022, Eugen, OR. (Poster, June 19-24, 2022)
2. **Rashid Mia**, Wallace, K. J. *Killing Two Bird with One Stone: The Simultaneous Phosphorylation and Capturing of Phosphorylated Cyanide Ions Using a Single*

- Fluorescence Chemodosimeter*, SERMACS 2021, Birmingham, AL. (Poster, Nov 10-13, 2021)
3. Rashid Mia, Wallace, K. J. *Design and Synthesis of low molecular weight fluorescence probes (LMFPs) for the detection of organophosphates and Nerve agents*, 262nd ACS National Conference Fall-2021, Atlanta, GA (Oral, Aug 22-26).
 4. Rashid Mia. *Lanthanide Pillar[5]arene Macrocyclic Host to Bind New Psychoactive Substance Drugs*, 261st ACS National Conference Spring-2021 (Oral).
 5. Rashid Mia, Wallace, K. J. *Bowl-Shaped Lanthanide Pillar[5]arene Macrocyclic Cage for Adamantyl Derivative New Psychoactive Substance Drugs*, Mississippi Academy of Science, Biloxi, MS (Oral, 2021)
 6. Rashid Mia, Wallace, K. J. *Synthesis of low molecular weight fluorescence probes (LMFPs) for the detection of organophosphates*, Susan A. Siltanen Graduate Student Research Symposium, University of Southern Mississippi (USM) Hattiesburg, Spring-2021 (Oral)
 7. Rashid Mia. *Portable Device for the Naked-eye Detection of Nerve Agents*, USM 3MT competition, 2020

D. INVITED TALK

1. Rashid Mia, "Design and Synthesis of Fluorescent Probes for the Detection of Toxic Analytes"; Bangladesh Chemical and Biochemical Association in North America (BACABANA)-2022

REVIEWER OF PEER REVIEW JOURNALS (2)

1. July 2022-RSC Advance
2. Dec 2022-RSC Advance

RESEARCH FUNDING

1. Received Research Creative Activity (RCA) grant as a Principle Investigator - \$8911 plus six weeks summer salary.
2. **DoD** (department of defense) grant: I have design sensors for department of defense (Army) to detect toxic chemical warfare agents which was funded by DoD. I have worked as research assistant for 2.5 years during PhD and also worked on same funding as a postdoctoral research associate for 7 months until start my independent career as assistant professor.
3. **University of Texas Rising Star Instrumental Grant** - "To Acquire a Cutting-edge Research Grade Fluorometer" - \$40,701 (proposal submitted).

HIGHLIGHTS

1. **News Coverage:** I was featured in the University of southern Mississippi's news portal for my accomplishments. Below is the link.
<https://www.usm.edu/news/2022/release/graduate-joins-texasu.php>
2. **American chemical society (ACS) Conference President-** Self-assembly host-guest session, 262nd ACS National Conference, Fall-2021
3. I have set up "Mia research lab" at Stephen F. Austin state university where working on multiple research projects on toxic analytes detection.

AWARD & HONORS

- **Postdoctoral Research Fellowship**, University of Southern Mississippi (DoD funded)
- **Graduate Research Assistantship**, University of Southern Mississippi (DoD funded)
- **Graduate Teaching Assistantship**, Awarded by University of Southern Mississippi.
- **Travel Award** (University of Southern Mississippi, 2021, 2022)
- Graduate scholarship (University of Dhaka, 2012-2013)
- Undergraduate scholarship (University of Dhaka, 2008-2012)
- Sheikh Hasina-Hamid Memorial Scholarship (2005-2006)
- Academic Achievement in Chemistry high school Award (2006)
- Outstanding senior high school award (2005)

RESEARCH STUDENTS SUPERVISED

- At Stephen F. Austin State University (2022-present)
 - Jack Weeks (undergraduate)
 - Blake Maillet (undergraduate)
 - Claudia Mugo (undergraduate)
 - Maxwell Pafford (undergraduate)
- At University of Southern Mississippi (2017-2022)
 - Nazmul Hossen (graduate student)
 - Maritza Diaz Castillo (undergraduate)
 - Katherine Kellicut (undergraduate)
 - Sarah Simmons (REU)
 - James Lock (undergraduate)
 - Rayan Haralson (undergraduate)
 - Sarah Morgan (SEED)
 - Cameron white (undergraduate)

RESEARCH PROJECTS

- **Sensor for single analyte: *Low molecular fluorescent probes (LMFPs) for the remote detection of nerve agents and Organophosphates (DoD funded project)*** - A library of coumarin-enamine LMFPs were designed and synthesized and characterized each probe using NMR, ESI-MS, and FT-IR spectroscopy. FT-IR used as verified the conversion from starting materials to products during various steps of probe synthesis. Their photophysical study investigated in various solvent which includes absorption, emission spectra, quantum yield study and fluorescence lifetime study. Upon the addition of nerve agents and OPs to the LMFPs, optical responses (UV-vis) and fluorescent spectra were analyzed. The goal of this project was to prepare a high quantum yield containing LMFPs for the nerve agents and OPs. (*Journal of Luminescence* 2021, 235, 118053)
- **Bifunctional Sensor: *The Simultaneous Phosphorylation and Capturing of Phosphorylated Cyanide Ions Using a Single Fluorescent Chemodosimeter (DoD funded project)*** - A heteroditopic coumarin-enamine Chemodosimeter were designed and synthesized in five steps, oximate simultaneously attack phosphorous (V) center of tabun nerve agent and capture leaving group cyanide ions through Michael-addition of enamine moiety. Chemodosimeter was characterized using NMR, ESI-MS, and FT-IR spectroscopy. Upon the addition of tabun mimic DEPC, optical responses (UV-vis) and fluorescent spectra were analyzed that showed simultaneous detection. 1D, 2D NMR, 31P NMR, ESI-MS further confirmed the simultaneous detection of phosphorous (V) center of tabun mimic and capturing cyanide leaving group. Also DFT calculation showed bis-adduct is the most stable and LoD found to be 11 ppb. (*New Journal of Chemistry*, 2022;46(44):21278-86).
- **Sensor for Ion-pairs: *Structural Features of a family of Coumarin-enamine Fluorescent Chemodosimeters for Ion-pairs*** - A family of coumarin-enamine chemodosimeters is evaluated for their potential use as fluorescent molecular probes for multiple analytes [cadmium(II), cobalt(II), copper(II), iron(II), nickel(II), lead(II), and zinc(II)], as their chloride and acetate salts. These fluorophores displayed excellent optical spectroscopic modulation when exposed to ion pairs with different Lewis acidic and basic properties in dimethyl sulfoxide (DMSO). The chemodosimeters were designed to undergo excited-state intramolecular proton transfer (ESIPT). A more basic anion, e.g., acetate, inhibited the ESIPT mechanism by deprotonation of the enol, producing a binding pocket (N⁺O⁻-chelate) that can coordinate to an appropriate metal ion. Coordination of the metal ions enhances the fluorescent intensity via the chelation-enhanced fluorescence emission mechanism. These compounds are examples of versatile, low-molecular-weight, dual-channel fluorescent sensors for ion-pair recognition. (*Inorganic Chemistry*, 2021, 60 (18), 14238-14252)
- **Multi-chromophoric Sensor: *Multi-chromophoric Pillar[5]arene Fluorescent Macrocyclic Cage for Al³⁺ ions Detection*** - Triazole and pyridine are well known for metal coordination which was incorporated with pillar[5]arene macrocycle. The macrocycle was found to undergo conformational changes, leading to the formation

of four major isomers cone, partially cone (pacone), and two alternate isomers. Only the cone isomer can coordinate the Al^{3+} ions at the bottom rim of the macrocycle over the other metals (Zn^{2+} , Cd^{2+} , Hg^{2+} , Pb^{2+} , Co^{2+} , Ni^{2+} , Cu^{2+} , Mg^{2+} , Ca^{2+} , Cr^{3+} , Ag^+ , Na^+ , K^+) with response ratio 103-fold enhancement via fluorescence spectroscopy. $^1\text{H-NMR}$ titration, UV-vis, fluorescent, fluorescent lifetime, mass-spectrometry experiment also carried out to confirm binding event, enhance selectivity, calculate binding constant, limit of detection also calculated. (Manuscript in preparation)

- **Electrochemical Sensor: *Differential pulse voltammetry (DPV) and ECL detection of nerve agents/OPs (DoD funded project)*** - I have incorporated a bis-propyl tertiary amin group at 7-position of coumarin-enamine derivatives in order to evaluate electrochemical properties of coumarin-enamine moiety as tertiary propyl amine is well known coreactant for electrogenerated chemiluminescence (ECL) study. Coumarin-enamine probe can detect OPs via DPV and ECL study. Designing and synthesis, photophysical studies, quantum yield calculation, optical study-UV-vis, fluorescence, fluorescence lifetime, limit of detection calculation was carried out. Electrochemical study CV, DPV and ECL studies also were carried out for the fundamental electrochemical understanding of coumarin-enamine probes and for the detection of organophosphates. (Manuscript in preparation).
- **Toxic Metal Detection and Cell Imaging:** Two sensors which are coumarin-derived quinoline connecting with an imine-amide moiety which serves as binding site for Cd^{2+} and Zn^{2+} . Their binding interactions are explored by UV-vis, steady state fluorescence, fluorescence lifetime, porton-NMR, and mass-spectrometry. Furthermore, Sensor has been deployed in biological systems where it detects Cd^{2+} and Zn^{2+} in HKD cell. Thus, sensors can be utilized for cell imaging. (Manuscript in Preparation)
- **Sensor for Synthetic Drugs: *Lanthanide Pillar[5]arene Macrocylic Host to bind New Psychoactive Substance Drugs*** - A series of lanthanide based bowl-shaped macrocyclic compounds have been prepared and have shown to bind adamantly derivatives new psychoactive substances(NPS) drugs. The macrocycle was found to undergo conformational changes, leading to the formation of four major isomers cone, partially cone (pacone), and two alternate isomers. Ligand 'cone' can coordinate the lanthanide ions at the bottom rim of the macrocycle to form $\text{Ln}[\text{cone}]$. 4,4,4-trifluoro-1-phenyl-1,3-butanedione & 4,4,4-trifluoro(2-naphthyl)-1,3-butanedione were used as an antenna to sensitize Tb^{3+} and Eu^{3+} lanthanide ions, respectively. Utilizing hydrophobic interaction NPS will be detect by macrocycle electron rich cavity through phosphorescence quenching.

SKILLS AND TECHNIQUES

- Inorganic, Supramolecular, Organometallic, Analytical Chemistry
- Molecular design (Chemosensor, Fluorescent probes), Host-guest chemistry
- Organic and Inorganic synthesis
- Product separation and purification techniques
- NMR techniques
- Low resolution mass spectrometry (ESI-MS, CID fragmentations, LQX Tune/Xcalibur)

- FI-IR
- UV-vis
- Fluorescence spectroscopy
- Fluorescence lifetime spectroscopy
- Phosphorescence spectroscopy
- Crystal growth
- Gas chromatography
- Electrochemistry (CV, DPV and ECL)
- Toxic analytes detection

RESEARCH PROFILE

- i) Google Scholar: <https://scholar.google.com/citations?user=a79npOoAAAAJ&hl=en&oi=ao>
- ii) ResearchGate: <https://www.researchgate.net/profile/Rashid-Mia>
- iii) University Website: <https://www.sfasu.edu/academics/colleges/sciences-math/chemistry-biochemistry/about/faculty-staff>

TEACHING EXPERIENCES

- **Courses taught:**
 - Inorganic chemistry (CHEM 3311)
 - Intro to chemistry (CHEM 1305)
 - Intro to Chemistry Lab (CHEM 1305)
 - Intro to Chemistry Lab online (CHEM 1105)
 - General Chemistry I laboratory (CHE 106L)
 - General chemistry II laboratory (CHE 107L)
 - Organic Chemistry I laboratory (CHE 255L)
 - Chemistry Fundamentals of general, organic, and biochemistry (CHE 110L).
- **Curriculum Development:**
 - Inorganic chemistry (CHEM 3311)
 - Intro to chemistry (CHEM 1305)
 - Intro to Chemistry Lab (CHEM 1305)

SEVICE At STEPHEN F. AUSTIN STATE UNIVERSITY

- Teaching and research in Chemistry
- Undergraduate Advising and mentoring
- Developing research project, applying for funding, mentoring student in Mia research laboratory
- Serving in various departmental committees (scholarship, chemical safety, student enrollment, NMR instrument, showcase Saturday for undergraduate outreach, etc)

PROFESSIONAL AFFILIATIONS & OUTREACH

President- Chemistry & Biochemistry graduate student org. (USM)
Member of American Chemical Society
Member of Mississippi Academy of Science
USM Grant writing & faculty development workshop
Volunteer at Mississippi student Olympics
Volunteer at Oak grove elementary mole day
Volunteer at graduate student fair on ACS conference

REFERENCE

1. Dr. Karl J. Wallace (PhD supervisor)
Professor, Chemistry and Biochemistry, University of Southern Mississippi (USM)
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2. Dr. Odutayo Odunuga,
Professor and Interim Chair, Department of Chemistry and Biochemistry, Stephen F.
Austin State University.
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3. Dr. Julie Pigza
Associate professor, Department of Chemistry and Biochemistry, USM
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4. Dr. Wujian Miao
Professor, Department of Chemistry and Biochemistry, USM
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