Curriculum Vitae

Dr. Moumita Gupta

Ph.D

School of Material Science and Engineering

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Objective

Being experienced with polymer / organic chemistry wanted to work with reputed R& D industries as a scientist.

Personal

Sex	:	Female
Place of Birth	:	Kolkata, India
Nationality	:	Indian
Marital status	:	Single
Languages	:	Bengali (Native), English, Hindi, Korean (Basic)
Permanent Address	:	7/43/1 Nabapally, NewBarrackPore, Kolkata-700131, West Bengal, India.

Educational Qualification

Degree	Subject	Institution	Year	Class/Awards
Doctor of Philosophy	Polymer Chemistry	**University of Ulsan,** Ulsan, South Korea	2014-2018	_
Master of Science	Organic Chemistry	**University of Calcutta,** Kolkata, India	2006-2008	Ist class, 67.2 %,
Bachelor of Science	Chemistry (Major), Mathematics and Physics	**University of Calcutta,** Kolkata, India	2003-2006	Ist class, 61.8 %,

Awards and Scolarships

- **Best Poster Award**

  Annual Fall Meeting-2019, The Polymer Society of Korea, Jeju, South Korea.

- **Qualified General Aptitude Test in Engineering (GATE)** (National Level Test)

  March 2013.

Working Experience in Research and Teaching

- **From March, 2019- December, 2019**

  Working as Post-Doctoral Research Fellow in Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea, where, development of peptides for CO delivery and synthesis of conjugated polymers with the helical morphology for the use in radar technology were handled under the supervision of Prof. Eunji Lee.

- **From May, 2019- till date**

  Peer reviewer for the Journal of Analytical Science and Technology.

- **From March, 2018- February, 2019**

  Working as Post-Doctoral Research Fellow in University of Ulsan, Ulsan, South Korea under the guidance of Prof. Hyung-il Lee. Developed optical sensors which can tune the sensing properties with morphological changes.

- **From March, 2014- February, 2018.**

  Working as a Ph.D. student in the department of chemistry, University of Ulsan, Ulsan, South Korea under the supervision of Prof. Hyung il Lee. The title of the thesis is- **Development of Small Molecule and Responsive Polymer Based Colorimetric and Fluorometric chemosensors**. In the thesis work several optical probes were developed based on small molecule and polymers for the detection of toxic metal ions, anions, gas, nerve agent, and picric acid.

- **From May, 2010- March, 2013.**

  Working as Junior Research Fellow (Project) in the DST- sponsored project under the guidance of **Dr. M. Jayakannan**, Department of Chemistry, IISER Pune, India. The title of project: "A Novel Green Polyurethane Synthesis via Melt Trans urethane Process." Block-co-polymers and hyperbranched polymers were developed by the melt-condensation route.

- **August 2008- May 2010**

  Worked as Lecturer in Bangabashi College, Kolkata. Where I have learnt handling students, and management work for the courses and official works.

Expertise in Research Areas

- **Functional Polymers** –Stimuli Responsive Polymers by controlled radical polymerization such as RAFT, ATRP, melt-condensation polymerization etc., study of intrinsic behaviours of polymers by operating the external stimuli (pH, Temperature and light).
- **Sensor Materials:** Development of molecular probes for environmentally and physically toxic heavy metal cations, anions, temperature sensors, amino acid sensor and nerves gases detection.
- **Organic Synthesis:** Development of small molecules and polymers.
- **Synthesis, Characterization of linear and Hyperbranched Polymers**– Hyperbranched poly(ester-urethane)s, polyurethanes, polyesters.
- **Polymer Nanomaterials –** Polymeric Nanoparticles.

Expereinece in Instruments

- **^{1}H, ^{13}C- NMR:** Experience in interpretation of NMR spectra and identification of compounds.
- **UV-Vis spectrophotometer** - Full operation.
- **Fluorescence spectrophotometer** - Full operation.
- **Circular Dichroism Spectroscopy** - Full operation.
- **Differential Scanning Calorimeter -** Experience in full operation and also interpretation of various thermal data such as T_g, T_m and crystallization, etc.
- **Thermo gravimetric analyser** - Handling the TGA and full operation.
- **FT-IR** - Full operation for solid as well as solution samples.
- **Automatic Viscometer** - Handling the automatic viscometer.
- **SEM** - Experience in sample preparation and morphology interpretation.
- **Dynamic Light Scattering –** Experience in sample preparation and interpretation of data.
- **TEM** and **AFM-** Full operation along with sample preparation, morphological interpretation.

List of Publications :

1. **Gupta, M.**; Balamurugan, A.;Lee , H.-i.; Azoaniline-Based Rapid and Selective Dual Sensor for Copper and Fluoride ions with Two Distinct Output Modes of Detection. *Sens. Actuators, B* **2015**, *211*, 531-536.

2. **Gupta, M.**; Lee, H.-i.; A Dual Responsive Molecular Probe for the Efficient and Selective Detection of Nerve Agent Mimics and Copper (II) ions with Controllable Detection Time. *Sens. Actuators, B* **2017**, *242*, 977−982.

3. **Gupta, M.**; Lee , H.-i.; A Pyrene Derived CO_2-Responsive Polymeric Probe for the Turn-on Fluorescent Detection of Nerve Agent Mimics with Tunable Sensitivity. *Macromolecules* **2017**, *50*, 6888-6895.

4. Kim, S.,-k.; **Gupta M.**; Lee, H.,-i.; A Recyclable Polymeric Film for the Consecutive Colorimetric Detection of Cysteine and Mercury ions in the Aqueous Solution. *Sens. Actuators, B* **2018**, *257*, 728-733.

5. **Gupta, M.**; Lee , H.-i.; Recyclable Polymeric Thin Films for the Selective Detection and Separation of Picric Acid. *ACS. Appl. Mater. Interfaces* **2018**, *10*, 41717-41723.

6. **Gupta, M.**; Lee , H.-i.; Water-Soluble Polymeric Probe with Dual Recognition Sites for the Sequential Colorimetric Detection of Cyanide and Fe (III) Ions. *Dyes and Pigments* **2019**, *167*, 174-180.

7. Annisa, T.N; Jung, S.-H.; **Gupta, M.**; Bae, J.-Y.; Park; J.-M.; Lee H.-i.; 'A Reusable Polymeric Film for the Alternating Colorimetric Detection of a Nerve Agent Mimic and Ammonia Vapor with Sub-Parts-per-Million Sensitivity'. *ACS. Appl. Mater. Interfaces* **2020**, *12*, 11055-11065.

8. Bak, J.,-M.; **Gupta, M.**; Lee, H.-i.; Efficient colorimetric detection of cyanide ions using hemicyanine-based polymeric probes with detection-induced self-assembly in water (**Manuscript communicated**)

Publications in Conference Proceedings

1. **Gupta Moumita**, Kim I.; Kim H. and Eunji Lee, "Controlled CO-releasing behaviour of Self-assembled Short-peptide Nanostructures.", *Annual Fall Meeting*, The Polymer Society of Korea, Jeju, South Korea (2019).
2. **Gupta Moumita** and Hyung-il Lee, "A pH-Tunable Pyrene Based Turn-on Fluorescent Polymeric Probe for the Detection of Nerve Agent Mimics", *Annual Spring Meeting*, The Polymer Society of Korea, Daejeon, South Korea (2017).

3. **Gupta Moumita** and Hyung-il Lee, "A pH-tunable Pyrene based Turn-on Fluorescent Polymeric Probe for the Detection of Nerve Agent Mimics", *IUPAC-PSK40* International Convention Centre Jeju, Jeju, South Korea (2016).
4. **Gupta Moumita** and Hyung-il Lee, "Azoaniline-based Rapid and Selective Dual Sensor for Copper and Fluoride ions in Two Different Output Modes of Detection", *The Polymer Society of Korea*, Exco, South Korea (2015).
5. **Gupta Moumita** and Hyung-il Lee, "Azoaniline –Based Bifunctional Probe for Rapid and Selective Detection of Cu^{2+} and F^- with Two Distinct Output Mode of Detection", *IUPAC-2015*, The Korean Chemical Society, Busan, South Korea (2015).
6. **Gupta Moumita** and Jayakannan, M., "New Hyperbranched polymers based on Amino acids", *PolyTech-2012*, Pune, India (2012).
7. **Gupta Moumita** and Jayakannan, M., "Designing of New Hyperbranched Polymer Based on Amino acid: L-Serine.", *Inter-IISER Meet*, IISER-Trivandrum, India (2011).

List of Referees

1. Prof. Hyung-il Lee

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2. Prof. M. Jayakannan

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3. Prof. S. K. Asha,

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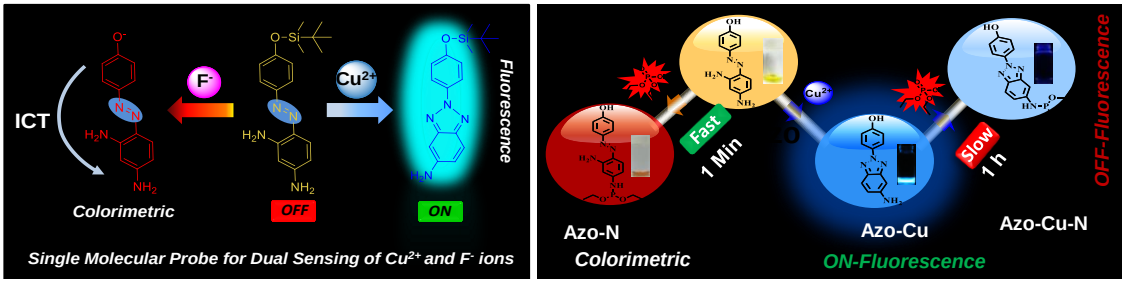
Summary of work

In recent years, the design and development of optical molecular probes for detection of toxic metal ions, anions, reactive species and gases have great interest in the field of chemistry and biology because of their impact on health and the environment. For instance, the over doses of toxic metals and anions result dangerous effects to human as well as eco-environment systems due to their indispensable roles in viral (or physiological) processes. Especially, mercury, iron and copper most toxic elements consequences most of the horrible diseases. Similarly, low concentrations toxic anions like fluoride and cyanide ions causes severe effects to human including the symptoms of dental and skeletal fluorosis, osteosarcoma, convulsion, vomiting and loss of consciousness. Furthermore, the detection of greenhouse gas carbon dioxide has gain wide interest due to effects to environment such as global warming. Thus, it is very important to design small molecule/stimuli responsive polymer-based probes for selective and efficient detection of cations, anions and gases. In the thesis work, we have developed both small molecules and responsive polymer-based molecular probes for the detection of toxic metal ions, anions, chemical warfare agents and picric acid by colorimetric /fluorometric detection approach. Furthermore, tunable sensitivity of responsive polymeric probes was also investigated towards metal ions, nerve gases and picric acid by operating the external stimuli.

Azoaniline-Derived Single Molecular Probes for Dual Ion Sensing with Two Distinct Output Modes of Detection

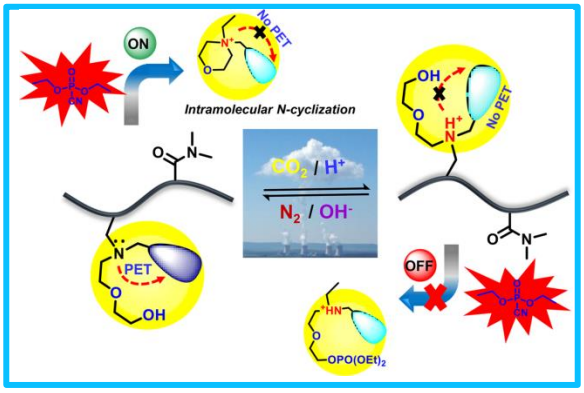
Here, we demonstrated the development of azoaniline-based small molecular probes for dual sensing of copper, chemical warfare agents and fluoride ions with two distinct modes of detection. Two new bifunctional probes were designed, which contain Cu^{2+}-sensitive o-(phenylazo)aniline, F^--sensitive silyl groups and free amine group to provide the reaction site for the detection of nerve agent mimics (DCP). Absorption and emission studies were conducted to examine the dual sensing abilities of these probes with the sequential addition of F^- followed by Cu^{2+} or the sequential addition of DCP followed by Cu^{2+} and vice-versa. Moreover, it was investigated that the detection time towards DCP could also be controlled by

the cyclization extent through a changing of the amount of Cu^{2+} ions that is added [*Sens. Actuators, B* **2015**, *211*, 531-536 ; *Sens. Actuators, B* **2017**, *242*, 977−982].



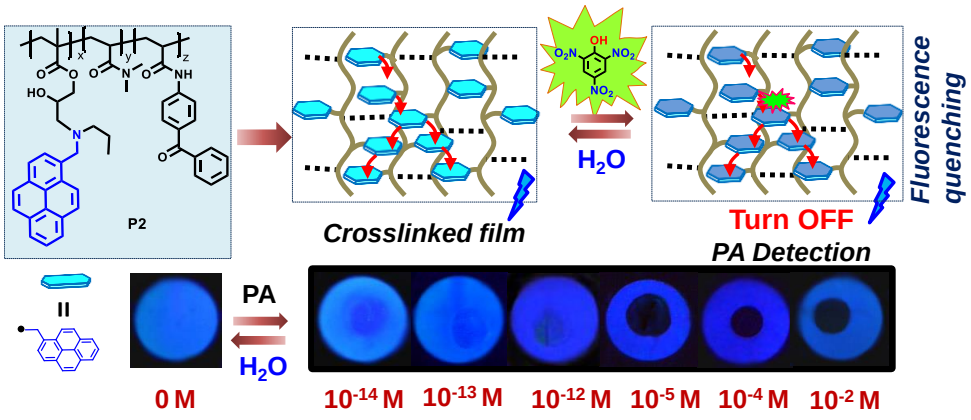
A Pyrene Derived CO_2-Responsive Polymeric Probe for the Turn-on Fluorescent Detection of Nerve Agent Mimics with Tunable Sensitivity

In this work, we emphasized the synthesis and development of pyrene-based turn-on fluorescent polymeric probe for the tunable detection of nerve agent mimics. The newly synthesized polymeric probe P2 has shown selective turn-on fluorescence response towards detect diethyl cyanophosphate (DCNP), a nerve agent mimic in both the solution and vapor phase with a detection limit of 0.1 mM. due to DCNP promoted intramolecular *N*-alkylation. Moreover, the detection of DCNP was successfully controlled by altering the purging of CO_2/N_2 gases or tuning the pH of the solution. P2 showed an efficient ON/OFF reversible fluorescence response towards CO_2 and N_2 gases, further helping tunable ON/OFF sensing of DCNP. The CO_2-tunable detection of DCNP was further correlated to the pH-dependent control of detection sensitivity. Thus, these CO_2/pH controllable detection properties can offer new insights into the design of new stimuli-responsive polymeric probes with fluorescence turn-on detection of nerve agent mimics [*Macromolecules* **2017**, *50*, 6888-6895].



Recyclable Polymeric Thin Films for the Selective Detection and Separation of Picric Acid

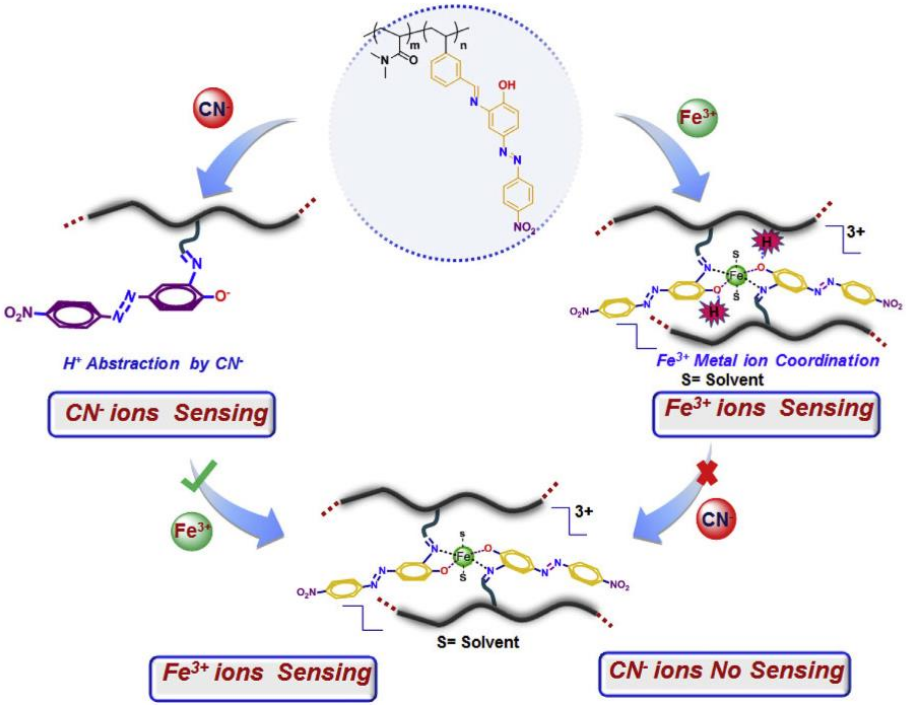
Thin-film probes have been developed for the reversible detection and separation of picric acid (PA) with extreme sensitivity in aqueous media. The free radical copolymerization of dimethylacrylamide (DMA), benzophenone acrylamide (BPAM), and glycidyl methacrylate (GMA) with a feed ratio of 95:1:4 yielded [p(DMA-*co*-BPAM-*co*-GMA)] (P1). P1 was transformed to the final polymeric probe, P2, by a subsequent ring-opening reaction between N-(pyren-1-ylmethyl)propan-1-amine with the epoxide unit of P1. P2 exhibited rapid and selective sensing properties toward PA in aqueous media via turn-off fluorescence emission. The detection sensitivity was tuned precisely by varying the pH of the solution. After the immobilization of P2 on a quartz slide by spin-coating, followed by exposure to UV light, the resulting film exhibited an attogram-level detection limit toward PA. The photo-induced electron transfer (PET) together with an energy transfer process between PA and the pyrene units of P2 were maximized by the strong π–π stacking of pyrene units of P2, which in turn induced rapid exciton energy diffusion. Furthermore, the separation of PA from the mixture of the various nitroaromatic compounds by the P2 film was achieved. While the detection process of PA was reversible and repeatable over multiple cycles, the P2 film could be recycled. [*ACS. Appl. Mater. Interfaces* **2018**, *10*, 41717-41723].



Water-Soluble Polymeric Probe with Dual Recognition Sites for the Sequential Colorimetric Detection of Cyanide and Fe (III) Ions

Polymeric probe P2 was developed for the colorimetric detection of Fe^{3+} and CN^- ions in aqueous media. It was synthesized followed by two steps: firstly, P1 was produced by RAFT polymerization of DMA and GMA with a feed ratio of 95: 5 in presence of AIBN as initiator

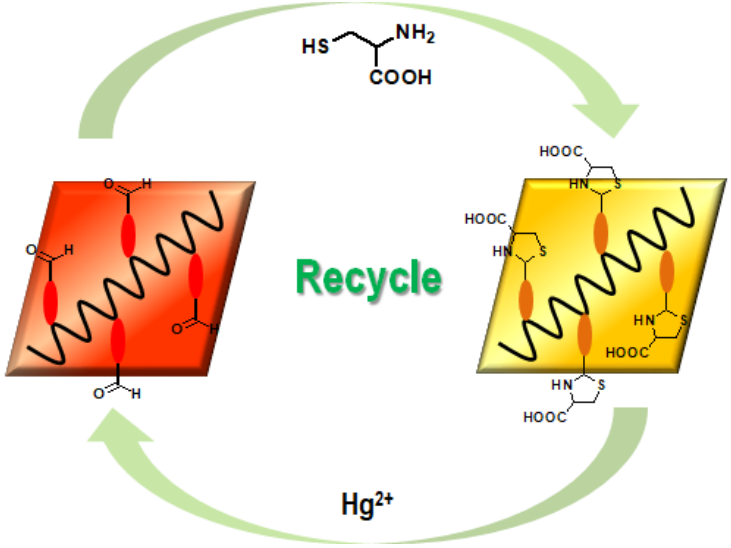
and DMP as CTA. Then Post- polymerization was taken place by ald-imine reaction with (E) -2-amino-4-((4-nitrophenyl)diazenyl)phenol to obtain P2. Probe P2, showed pH-responsive as well as solvatochromic behaviour which intervene into the sensing study, majorly, for the anions. At low pH, P2 was able to detect CN^- ions whereas, at high pH, there was no sensing. Similar trend was carried forward while moving from nonpolar to polar solvents; in non-polar organic solvents distinct detection was there, but in polar aprotic solvents no detection was found. Then the probe was subjected to check for the efficient and selective detection of Fe^{3+} ions. Finally, sequential addition of the CN^- ions followed by the Fe^{3+} ions exhibited excellent dual sensing ability of the probe compared to the other way of addition. [*Dyes and Pigments* **2019**, *167*, 174-180.]



A Recyclable Polymeric Film for the Consecutive Colorimetric Detection of Cysteine and Mercury ions in the Aqueous Solution

A recyclable polymeric film was designed and prepared for the consecutive colorimetric detection of cysteine and mercury (II) ions. A target random terpolymer (P1) of N,N-dimethylacrylamide (DMA), (E)-2-((4-((4-formylphenyl)diazenyl)phenyl)(methyl)amino) ethyl acrylate (FPDEA, M1), and N-(4-benzoylphenyl)acrylamide (BPAm) was synthesized

via free radical polymerization (FRP). The average molecular weight (Mn) of [p(DMA-co-FPDEA-co-BPAm), P1] was 39,300, and the molecular weight distribution (Mw/Mn) was 1.6. P1 exhibited excellent sensitivity and selectivity towards cysteine in the aqueous media. A simple reaction between the aldehyde groups of P1 and cysteine led to the formation of P2 with five-membered rings, accompanied by the color change from orange to yellow. The in situ generated P2 after cysteine detection responded selectively to mercury (II) ions in which the five-membered rings of P2 dissociated into P1 with CHO groups and cysteine. For further film study to demonstrate the reversiblity of the system, P1 was immobilized on a quartz slide by the spin-coating, followed by the exposure to UV light. The resulting film was successfully used for the consecutive colorimetric detection of cysteine and mercury (II) ions, demonstrating its reusability even after multiple cycles. [*Sens. Actuators, B* **2018**, *257*, 728-733.]



A Reusable Polymeric Film for the Alternating Colorimetric Detection of a Nerve Agent Mimic and Ammonia Vapor with Sub-Parts-per-Million Sensitivity

Thin polymeric films were developed for the vapor-phase sequential colorimetric detection of a nerve agent mimic and ammonia with high sensitivity. N-(4-Benzoylphenyl)acrylamide (BPAm), N,N-dimethylacrylamide (DMA), and (E)-2- (methyl(4-(pyridine-4yldiazenyl)phenyl)amino)ethyl acrylate (MPDEA, M1) were copolymerized via free radical polymerization (FRP) to yield p(BPAm-co-DMA-co-MPDEA), hereafter referred to as P1. P1 exhibits selective sensing properties toward diethyl chlorophosphate (DCP), a nerve agent mimic, in pure aqueous media. Upon the addition of DCP, the pyridine groups of P1 were quaternized with DCP, accompanied by a color change from yellow to pink due to the

enhancement of the intramolecular charge transfer (ICT) effect. In situ generated quaternized P1, hereafter referred to as P2, after DCP sensing was used to selectively detect ammonia via dequaternization in an aqueous medium. Ammonia detection was indicated by a color change in the solution from pink back to yellow. A surface-immobilized P1 film was prepared and employed for the vapor-phase detection of DCP, demonstrating that an amount of as low as 2 ppm was detectable. Ammonia vapor was also successfully detected by the P2 film via the ammoniatriggered removal of the quaternized phosphates. Alternating exposure of the film to DCP and ammonia resulted in the corresponding color changes, thereby demonstrating the reversibility of the system. The reusability of the polymeric film for detecting DCP and ammonia in the vapor phase was confirmed by performing four sequential colorimetric detection cycles. [*ACS. Appl. Mater. Interfaces* **2020**, *12*, 11055-11065]