

National Institute of Technology, Tiruchirappalli: Performa for CV of Faculty/ Staff Members

Curriculum Vitae

Brief Profile:

I am an Assistant Professor in Chemistry at NIT Trichy, India. My research interest involves the development and utilization of various spectroscopic, microscopic and electrochemical techniques to address challenging problems in the field of chemistry, materials and biology.

Prior to my joining the current independent position, I worked as a Postdoctoral Research Associate in the research group of Professor Neal W. Woodbury at the Biodesign Institute of Arizona State University, USA. In Woodbury group, I worked for 2.7 years (October 2015 – June 2018) focusing on the studies of (1) electron transfer and energy transfer mechanisms in bacterial photosynthetic systems, (2) making programmable DNA nanostructures-based excitonic circuits for artificial light harvesting and energy transfer systems, and (3) developing (bio)photoelectrochemical cells by designing and integrating Photosystem I (PSI)-based electron transfer chains on suitable electrodes for efficient conversion of light energy into electrical energy and (bio)fuels.

Previously, I worked as a Postdoctoral Research Scientist at Columbia University, New York, USA for one year (September 2014 – September 2015) with Professor Kenneth B. Eisenthal. In the Eisenthal group, I primarily focused on developing nonlinear second harmonic generation (SHG) spectroscopy to study binding/bending interactions and dynamics of a restriction enzyme, EcoRV with DNA.

I received my Ph.D. under the supervision of Professor Nilmoni Sarkar in July 2014 from the Department of Chemistry at Indian Institute of Technology Kharagpur. During this period, I investigated in considerable detail various biologically important photophysical and dynamical processes namely, excited state intramolecular proton transfer (ESIPT), photo-induced electron transfer (PET), fluorescence resonance energy transfer (FRET), solvation and rotational dynamics in a wide variety of biomimetic confined microenvironments.

I received my M.Sc. from Indian Institute of Technology Kharagpur, India, in 2010. My Master project thesis, under the supervision of Professor Nilmoni Sarkar, focused on photo-induced electron transfer processes in room temperature ionic liquid (RTIL) and RTIL/co-solvent binary mixtures, exploring their micro-heterogeneous properties.



Dr. Sarthak Mandal

Email: smandal@nitt.edu

Webpage:

<https://sites.google.com/view/smandal-spectroscopy-group/>

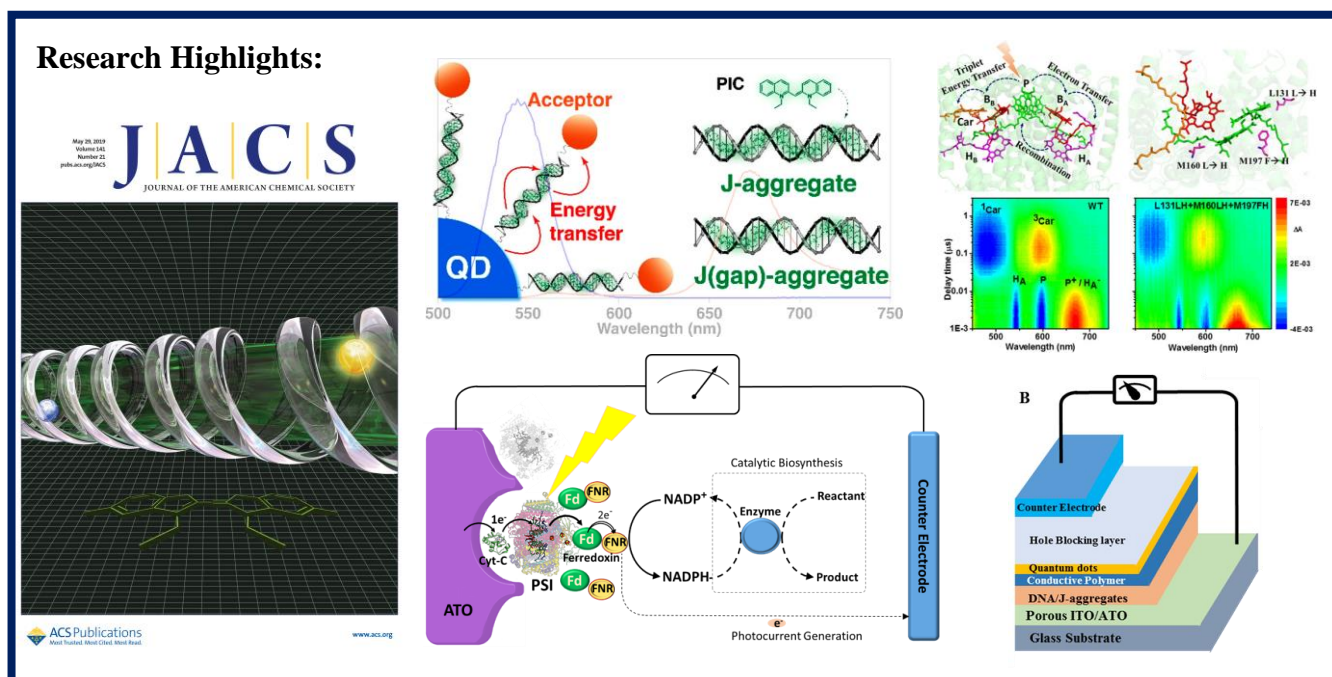
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Research Interests:

- **Ultrafast Photo-physical and Dynamical Processes in Chemistry, Materials and Biology.**
- **Building Bio-mimetic Artificial Photosynthetic Systems and Their Photoelectronic Applications.**
- **Photoelectrochemical Cell Development for Conversion of Light Energy into Electricity and Fuels**
- **Molecular biophysics and biochemistry.**

Our research focuses on the spectroscopic, microscopic and electrochemical investigations on advanced functional materials for light energy harvesting and its conversion to electrical and chemical energy.

One of the primary goals of our research is to design and develop artificial bio-mimetic photosynthetic systems using synthetic dye aggregates, conducting polymers, quantum dots and/or inorganic-organic halide perovskites on the templates of DNA, proteins and polymers. Their photoelectronic applications towards the conversion of light energy into electrochemical energy will be explored through the development of photo-electrochemical cells on suitable electrode supports. In this research we stress on advancing our knowledge and understanding on efficient excitation energy transfer (beyond FRET limit), and charge separation mechanisms in solution and at interfaces.



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1. **Name: Dr. Sarthak Mandal**

2. Designation: Assistant Professor

3. Office Address: Room No. CHEM - 320, Department of Chemistry; NIT Trichy

4. Telephone (Direct) (Optional):

Telephone : Extn (Optional):

Mobile (Optional): +91-8158805377

5. Email (Primary): smandal@nitt.edu

Email (Secondary) :

sarthakmandal@gmail.com

6. Field(s) of Specialization: Physical Chemistry/Spectroscopy and Chemical Dynamics

7. Employment Profile

Job Title	Employer	From	To
Assistant Professor	National Institute of Technology Tiruchirappalli, India	July 2018	Present
Postdoctoral Research Associate	Arizona State University, Arizona, USA	October 2015	June 2018
Postdoctoral Research Scientist	Columbia University, New York, USA	September 2014	September 2015

8. Academic Qualifications (From Highest Degree to High School):

Examination	Board / University	Year	Division/ Grade	Subjects
Ph.D.	Indian Institute of Technology Kharagpur, West Bengal, India	2014		Physical Chemistry (Spectroscopy and Dynamics)
M.Sc.	Indian Institute of Technology Kharagpur, West Bengal, India	2010	First	Chemistry (Physical Chemistry)
B.Sc.	The University of Burdwan, West Bengal, India	2008	First (Rank 2)	Chemistry (Hons.), Math. and Phys. (Pass)

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9. Awards, Associateships etc.

Year of Award	Name of the Award	Awarding Organization
May 2019	Faculty Award	NIT Tiruchirappalli
July 2018	DST-Inspire Faculty Award	Department of Science and Technology, Govt. of India
June 2009 and December 2009	CSIR-NET	CSIR, New Delhi, Govt. of India
February 2010	GATE (All India Rank 94 among 8056 students)	Indian Institute of Technologies (IITs)
April 2008	Joint Entrance Admission to M.Sc. (JAM) (All India Rank 14 among 2439 students)	Indian Institute of Technologies (IITs)
July 2008	Satchidananda Gold Medal	Bankura Christian College

10. Fellowships

Year of Award	Name of the Fellowship	Awarding Organization	From (Month/Year)	To (Month/Year)
2009	IASc-INSA-NASI Summer Research Fellowship	Indian Academy of Science	May 2009	July 2009
2008	Merit-Cum-Means (MCM) Fellowship	Indian Institute of Technology Kharagpur	August 2008	July 2010

11. Details of Major R&D Projects

Title of Project	Funding Agency	Duration		Status
		From	To	Ongoing/ Completed
Building Artificial Light Harvesting Systems and Understanding of Their Energy Transfer Mechanisms and Photoelectronic Applications	DST	July 2018	July 2023	Ongoing

12. Participation in Workshops/ Symposia/ Conferences/ Colloquia /Seminars/ Schools etc. (mentioning the role)

Date (s)	Title of Activity	Level of Event (International/ National/ Local)	Role (Participant/ Speaker/ Chairperson, Paper)	Event Organized by	Venue
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			presenter, Any other)		
February 17 – 21, 2018	62 nd Biophysical Society Annual Meeting	International	Poster	Biophysical Society	San Francisco, California
April 13, 2018	Biodesign Fusion Scientific Retreat	National	Speaker	ASU, USA	Arizona, USA
January 5 – 8, 2017	26 th Western Photosynthesis Conference	International	Speaker	Department of Energy, USA	San Francisco
April 1, 2016	Biodesign Fusion 2016	International	Poster	Arizona State University, USA	Arizona
November 24 – 28, 2013	Fluorescence Correlation Spectroscopy (FCS) Workshop	National	Poster	TIFR, IISc and JNCASR, India	JNCASR Bangalore
March 1, 2013	4 th Research Scholar Day	National	Speaker	Chemistry Department, IIT KGP	IIT Kharagpur

13. Academic Foreign Visits

Country	Duration of Visit	Programme
USA	October 2015 – June 2018	Postdoctoral Research Associate
USA	September 2014 – September 2015	Postdoctoral Research Scientist

14. Publications

(A) Refereed Research Journals:

Google Scholar: <https://scholar.google.com/citations?user=V0XHogMAAAAJ&hl=en> (h-index: 18, Total Citation: 809)

ORCID: orcid.org/0000-0002-5592-9664

- 1) **S. Mandal**,* X. Zhou, S. Lin, H. Yan, and N. Woodbury “Directed Energy Transfer through DNA-Templated J-Aggregates” *Bioconjugate Chem.* (2019) ASAP (DOI: 10.1021/acs.bioconjchem.9b00043) (* As Corresponding Author)

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- 2) **S. Mandal,**[#] X. Zhou,[#] S. Jiang, S. Lin, J. Yang, Y. Liu, D. G. Whitten, N. W. Woodbury, and H. Yan “Efficient Long-Range, Directional Energy Transfer through DNA-Templated Dye Aggregates” *J. Am. Chem. Soc.* (2019) ASAP (DOI: 10.1021/jacs.9b01548) (**# Co-First Author**)
- 3) **S. Mandal,*** E. Espiritu, N. Akram, S. Lin, J. C. Williams, J. P. Allen, N. W. Woodbury* “Influence of the Electrochemical Properties of the Bacteriochlorophyll Dimer on Triplet Energy Transfer Dynamics in Bacterial Reaction Centers” *J. Phys. Chem. B* (2018) 122, 10097. (*** As Corresponding Author**)
- 4) E. Boulais, N. Sawaya , R. Veneziano, A. Andreoni, J. Banal, T. Kondo, **S. Mandal,** S. Lin, G. Schlau-Cohen, N. Woodbury, H. Yan , A. Aspuru-Guzik, M. Bathe “Programmed coherent coupling in a synthetic DNA-based excitonic circuit” *Nature Materials*, (2017) DOI: 10.1038/nmat5033.
- 5) **S. Mandal,*** A. M. Carey, J. Locsin, B. R. Gao, J. C. Williams, J. P. Allen, S. Lin, N. W. Woodbury* “Mechanism of triplet energy transfer in photosynthetic bacterial reaction centers” *J. Phys. Chem. B* (2017), 121, 6499 – 6510. (*** As Corresponding Author**)
- 6) J. Ma, **S. Mandal,** C. Bronsther, Z. Gao, K. B. Eisenthal “Second harmonic study of acid-base equilibrium at gold nanoparticle/aqueous interface” *Chem. Phys. Lett.* (2017) 166 – 171.
- 7) **S. Mandal,** J. Kuchlyan, S. Ghosh, C. Banerjee, N. Kundu, D. Banik, and N. Sarkar “Vesicles formed in aqueous mixtures of cholesterol and imidazolium surface active ionic liquid: a comparison with common cationic surfactant by water dynamics” *J. Phys. Chem. B* (2014), 118, 5913–5923.
- 8) **S. Mandal,** S. Ghosh, D. Banik, C. Banerjee, J. Kuchlyan, and N. Sarkar. “An investigation into the effect of the structure of bile salt aggregates on the binding interactions and ESIHT dynamics of curcumin.” *J. Phys. Chem. B* (2013), 117 (44), 13795–13807.
- 9) **S. Mandal,** C. Ghatak, V. G. Rao, S. Ghosh, and N. Sarkar “Pluronic micellar aggregates loaded with gold nanoparticles and fluorescent dyes: a study of controlled nanometal surface energy transfer” *J. Phys. Chem. C* (2012), 116(9), 5585-5597.

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- 10) **S. Mandal**, S. Ghosh, C. Banerjee, J. Kuchlyan, and N. Sarkar. “Unique photophysical behavior of 2,2'-bipyridine-3,3'-diol in DMSO–water binary mixtures: potential application for fluorescence sensing of Zn²⁺” *J. Phys. Chem. B* (2013), 117 (40), 12212–12223.
- 11) **S. Mandal**, C. Banerjee, S. Ghosh, J. Kuchlyan, and N. Sarkar. “Modulation of the photophysical properties of curcumin in non-ionic surfactant forming micelles and niosomes” *J. Phys. Chem. B* (2013), 117 (23), 6957–6968.
- 12) **S. Mandal**, S. Ghosh, C. Banerjee, J. Kuchlyan, and N. Sarkar. “Roles of viscosity, polarity, and hydrogen bonding ability of a pyrrolidinium ionic liquid and its binary mixtures in the photophysics and rotational dynamics of 2,2'-bipyridine-3,3'-diol.” *J. Phys. Chem. B* (2013), 117 (22), 6789–6800.
- 13) **S. Mandal**, S. Ghosh, C. Banerjee, J. Kuchlyan, D. Banik, and N. Sarkar “A novel ionic liquid-in-oil microemulsion composed of biologically acceptable components: an excitation wavelength dependent fluorescence resonance energy transfer study” *J. Phys. Chem. B* (2013), 117(11), 3221–3231.
- 14) **S. Mandal**, S. Ghosh, H. H. K. Aggala, C. Banerjee, **V. G. Rao**, and N. Sarkar “Modulation of the photophysical properties of 2,2'-bipyridine-3,3'-diol inside bile salt aggregates: a fluorescence-based study for the molecular recognition of bile Salts” *Langmuir* (2013), 29 (1), 133–143.
- 15) **S. Mandal**, S. Ghosh, C. Banerjee, **V. G. Rao**, and N. Sarkar “Modulation of photophysics and photodynamics of 1'-hydroxy-2'-acetonaphthone in bile salt aggregates: a study of polarity and nanoconfinement effects” *J. Phys. Chem. B* (2012), 116(30), 8780-8792.
- 16) **S. Mandal**, V. G. Rao, C. Ghatak, R. Pramanik, S. Sarkar, and N. Sarkar “Photophysics and photodynamics of 1'-hydroxy-2'-acetonaphthone in micelles and nonionic surfactants forming vesicles” *J. Phys. Chem. B* (2011), 115(42), 12108-12119.
- 17) **S. Mandal**, J. Kuchlyan, S. Ghosh, C. Banerjee, D. Banik, and N. Sarkar “Ultrafast FRET to study spontaneous micelle-to-vesicle transitions in an aqueous mixed surface-active ionic-liquid system” *ChemPhysChem* (2014) 15(16), 3544 – 3553

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- 18) C. Banerjee, **S. Mandal**, S. Ghosh, J. Kuchlyan, N. Kundu, and N. Sarkar “Unique characteristics of ionic liquids comprised of long-chain cations and anions: a new physical insight” *J. Phys. Chem. B* (2013), 117(14), 3927–3934.
- 19) V. G. Rao, **S. Mandal**, S. Ghosh, C. Banerjee, and N. Sarkar “Phase boundaries, structural characteristics, and NMR spectra of ionic liquid-in-oil microemulsions containing double chain surface active ionic liquid” *J. Phys. Chem. B* (2013) 117(5), 1480–1493.
- 20) V. G. Rao, **S. Mandal**, S. Ghosh, C. Banerjee, and N. Sarkar “Aggregation behavior of triton X-100 with a mixture of two room-temperature ionic liquids” *J. Phys. Chem. B* (2012), 116(47), 13868-13877.
- 21) V. G. Rao, **S. Mandal**, S. Ghosh, C. Banerjee, and N. Sarkar “Study of fluorescence resonance energy transfer in zwitterionic micelle: Ionic-liquid-induced changes in FRET parameters” *J. Phys. Chem. B* (2012), 116(39), 12021-12029.
- 22) C. Banerjee, **S. Mandal**, S. Ghosh, V. G. Rao, and N. Sarkar “Tuning the probe location on zwitterionic micellar system with variation of pH and addition of surfactants with different alkyl chains” *J. Phys. Chem. B* (2012), 116(36), 11313-11322.
- 23) S. Ghosh, **S. Mandal**, C. Banerjee, V. G. Rao, and N. Sarkar “Photophysics of 3,3'-diethyloxadicarbocyanine iodide (DODCI) in ionic liquid micelle and binary mixtures of ionic liquids” *J. Phys. Chem. B* (2012), 116(31), 9482-9491.
- 24) V. G. Rao, **S. Mandal**, S. Ghosh, C. Banerjee, and N. Sarkar “Ionic liquid-in-oil microemulsions composed of double chain surface active ionic liquid as a surfactant: Temperature dependent solvent and rotational relaxation dynamics of Coumarin-153 in [Py][TF2N]/[C4mim][AOT] /benzene microemulsions” *J. Phys. Chem. B* (2012), 116(28), 8210-8221.
- 25) S. Sarkar, **S. Mandal**, C. Ghatak, V. G. Rao, S. Ghosh, and N. Sarkar “Photoinduced electron transfer in an imidazolium ionic liquid and in its binary mixtures with water, methanol, and 2-propanol” *J. Phys. Chem. B* (2012), 116(4), 1335-1344.
- 26) S. Sarkar, **S. Mandal**, R. Pramanik, C. Ghatak, V. G. Rao, and N. Sarkar “Photoinduced electron transfer in a room temperature ionic liquid 1-butyl-3-methylimidazolium octyl-

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- sulfate micelle: A temperature dependent study” *J. Phys. Chem. B* (2011), 115(19), 6100-6110.
- 27) S. Ghosh, C. Banerjee, **S. Mandal**, J. Kuchlyan, and N. Sarkar “Effect of Alkyl Chain of Room Temperature Ionic Liquid (RTILs) on the Phase Behavior of [C₂mim][C_nSO₄]/TX-100/Cyclohexane Microemulsions” *J. Phys. Chem. B* (2013), 117 (19), 5886–5897.
- 28) C. Banerjee, C. Ghatak, **S. Mandal**, S. Ghosh, J. Kuchlyan, and N. Sarkar “Curcumin in Reverse Micelle: An Example to Control Excited-State Intramolecular Proton Transfer (ESIPT) in Confined Media” *J. Phys. Chem. B* (2013), 117 (23), 6906–6916.
- 29) V. G. Rao, U. Brahmachari, **S. Mandal**, S. Ghosh, C. Banerjee, and N. Sarkar “Protic ionic liquid-induced changes in the properties of aqueous triton X-100 CTAB surfactant solution: Solvent and rotational relaxation studies” *Chem. Phys. Lett.* (2012), 552, 38-43.
- 30) C. Ghatak, V. G. Rao, **S. Mandal**, S. Ghosh, and N. Sarkar “An understanding of the modulation of photophysical properties of curcumin inside a micelle formed by an ionic Liquid: A new possibility of tunable drug delivery system” *J. Phys. Chem. B* (2012), 116(10), 3369-3379.
- 31) C. Ghatak, V. G. Rao, **S. Mandal**, and N. Sarkar “Photoinduced electron transfer between various coumarin analogues and N,N-dimethylaniline inside niosome, a nonionic innocuous polyethylene glycol-based surfactant assembly” *Phys. Chem. Chem. Phys.* (2012), 14(25), 8925-8935.
- 32) S. Ghosh, C. Ghatak, C. Banerjee, **S. Mandal**, J. Kuchlyan, and N. Sarkar “Spontaneous Transition of Micelle–Vesicle–Micelle in a Mixture of Cationic Surfactant and Anionic Surfactant-like Ionic Liquid: A Pure Nonlipid Small Unilamellar Vesicular Template Used for Solvent and Rotational Relaxation Study” *Langmuir* (2013), 29 (32), 10066–10076.
- 33) V. G. Rao, C. Banerjee, S. Ghosh, **S. Mandal**, J. Kuchlyan, and N. Sarkar “A Step toward the Development of High-Temperature Stable Ionic Liquid-in-Oil Microemulsions Containing Double-Chain Anionic Surface Active Ionic Liquid” *J. Phys. Chem. B* (2013), 117 (24), 7472–7480.

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Full list of publications can be found in

scholar.google.co.in/citations?user=VOXHogMAAAAJ&hl=en

https://www.researchgate.net/profile/Sarthak_Mandal

(B) Books & Monographs

- 1) V. G. Rao, C. Banerjee, S. Ghosh, **S. Mandal**, and N. Sarkar “Chapter 15. Designing a New Strategy for the Formation of IL-In-Oil Microemulsions Containing Double Chain Surface-Active Ionic Liquid” in the book *Ionic Liquid-Based Surfactant Science: Formulation, Characterization, and Applications*, Editor(s): Bidyut K. Paul, Satya P. Moulik, John Wiley & Sons, Inc.