Curriculum Vitae

Bidisha Sengupta, Ph.D
Associate Professor, Chemistry Department
500 W County Line Road, Tougaloo, MS 39174, USA
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Key Strength:

- Innovative and enthusiastic teacher. Teaches Biochemistry, Organic Chemistry, Instrumental Analysis, and Introduction to Chemistry.
- Strong background in defining novel research concepts, monitoring, evaluating and implementing new scientific and technological advancements.

Professional Experience:

May 2016 - present: **Associate Professor (with tenure)**, Chemistry, Tougaloo College.

January 2011 - April 2016: **Assistant Professor**, Chemistry, Tougaloo College

September 2006 - December 2010: **Post doctoral Research Associate,**
Department of Chemistry, Furman University, USA

July 2004 - June 2006 **Postdoctoral Research Associate,**
Department of Applied Physics, Chalmers University of Technology, Goteborg, Sweden.

March 2002 - March 2004 **Postdoctoral Research Associate,**
Biophysics Division, Saha Institute of Nuclear Physics (SINP), India.

Education:

Ph.D (1995 - 2001) Biophysical Chemistry,
Biophysics Division, Saha Institute of Nuclear Physics, (University of Calcutta) India.
Thesis entitled "Spectroscopic Investigations on some biologically important molecules in different environments".

Post-M.S. Associateship Biosciences
Diploma (1994-1995) SINP, Calcutta, India

M.S. (1992-1994) Biophysics, Molecular Biology and Genetics.
University of Calcutta. Calcutta, India.

B.S. (1989-1992) Chemistry (Major), Physics and Mathematics
Bethune College, University of Calcutta. Calcutta, India.

List of Publications: Total 50

Peer reviewed International Publications: 46

(H-index=22), $corr. auth.; *undergrad; @high school researcher

1. *Graphene oxide as selective transporter of flavonols for physiological target DNA: A two-color fluorescence approach,* **B. Sengupta,** J. Coleman, J. Johnson, M. Feng ***Spectrochimica Acta, A*** 214 (2019) 92-198 doi: 10.1016/j.saa.2019.02.029.
2. *The Effects of Hydraulic Fracturing on the Environment and Some Possible remediation Strategies,* C. Sen, **B. Sengupta**, M. D. Zaman, **Advances of Science and Technology,** 2018 (in press).
3. *Differential roles of 3-Hydroxyflavone and 7-Hydroxyflavone against nicotine-induced oxidative stress in rat renal proximal tubule cells,* **Bidisha Sengupta**$, Mehdi Sahihi, Monireh Dehkhodaei, Darrian Kelly*, Istvan Arany, ***PLOS One***, (2017) https://doi.org/10.1371/journal.pone.0179777
4. *Chiral Alkylated-Aniline as a Noninvasive Fluorescence Sensor: Spectroscopic and Molecular Modeling Studies,* **Bidisha Sengupta**$, Chirantan Sen Mukherjee@, Sandipan Chakrabarty, Maria Jones Muhammad*, William Gladney Jr.*, George Armstrong, ***Spectrochimica Acta, A*** 187 (2017) 23-29. doi: 10.1016/j.saa.2017.06.008.
5. *Influence of Aptamer-Enclosed Silver Nanoclusteron the Prevention of Biofilm by Bacillus thuringiensis,* **Bidisha Sengupta**$, Sudarson Sinha, Bianca Garner, Istvan Arany, Christa Corley*****, Keith Cobb*****, Elrica Brown*****, Paresh Ray, ***Nanoscience and Nanotechnology Letters***, 2016, 8, 1054-1060.
6. *DNA Scaffolded Silver Clusters: A Critical Study*, **Bidisha Sengupta**$, Christa Corley*, Keith Cobb*, Anthony Saracino* and Steffen Jockusch, ***Molecules*** 2016, *21*(2), 216; doi:10.3390/molecules21020216
7. *Excited State Proton Transfer of Natural Flavonoids and Their Chromophores in Duplex and Tetraplex DNAs*, **Bidisha Sengupta**$, Samantha M. Reilly, Donald E. Davis Jr*, Kisa Harris*, Randy M. Wadkins, Denise Ward*, D'Asia Gholar*, and Cari Hampton*, ***J. Phys. Chem. B,*** DOI: 10.1021/jp508599h 2014.
8. *Prospect of Bioflavonoid Fisetin as quadruplex ligand*, **Bidisha Sengupta$**, Biswapathik Pahari, Laura Blackmon*, Pradeep K. Sengupta, ***PLOS One,*** 8 (2013) e65383,1-11.
9. *Biophysical characterization of Genistein in its natural carrier human hemoglobin using spectroscopic and computational approaches,* Biswapathik Pahari, Sandipan Chakraborty, **Bidisha Sengupta$,** Sudip Chaudhuri, William Martin*, Jasmine Taylor*, Jordan Henley*, Donald Davis*, Pradip Biswas, Amit K. Sharma, Pradeep K. Sengupta, ***Food and Nutrition Science***, 4 (2013) 83-92.
10. *Interactions of dietary polyphenols with proteins: Insights from fluorescence spectroscopic and other related biophysical studies,* Sudip Chaudhuri, **Bidisha Sengupta**, Jasmine Taylor*, *Biswa Pathik Pahari, Pradeep K. Sengupta*, ***Current Drug Metabolism*** *14 (2013) 491-503.*
11. *Contrasting Binding of Fisetin and Daidzein in γ-cyclodextrin nanocavity,* Biswapathik Pahari, **Bidisha Sengupta**$, Sandipan Chakraborty, Briannica Thomas*, Dyffreon Mcgowan*, Pradeep K. Sengupta***, J. Photochem. Photobiol. B.*** 118 (2013) 33-41.
12. *Characterization of Diadzein-Hemoglobin Binding using Optical Spectroscopy and Molecular Dynamics Simulations*, **Bidisha Sengupta**, Sandipan Chakraborty, Maurice Crawford, Jasmine M. Taylor, Laura E. Blackmon*, Pradip K. Biswas, Wolfgang H. Kramer, ***Int. J. Biol. Macromol***. 51 (2012) 250– 258.

13. *Mechanistic insight into the Structure and Dynamics of lambda phage DNA. Sandipan Chakraborty, Takashi Uematsu, Christer Svanberg, Per Jacobsson, Michael Zach, Jan Swenson,* Rajender Trehan, George Armstrong and **Bidisha Sengupta**, ***J. Physical Chemistry A*** 116 (2012) 4274–4284.

14. *A critical study on the interactions of hesperitin with human hemoglobin: Fluorescence spectroscopic and molecular modeling approach.* Sandipan Chakrabarty, Sudip Chaudhuri, Biswapathik Pahari, Jasmine Taylor*, Pradeep K. Sengupta and **Bidisha Sengupta,** ***J. of Luminescence*** 132 (2012) 1522–1528.

15. *Optical Sensing by Transforming Chromophoric Silver Clusters in DNA Nanoreactors.* Jeffrey T. Petty, Sandra P. Story, Selina Juarez, Samuel Votto, Austin Herbst, Natalya N. Degtyareva and **Bidisha Sengupta**, ***Analytical Chemistry***, 84 (1), 2012, pp 356–364.

16. *Binding and antioxidant properties of therapeutically important plant flavonoids in biomembranes: Insights from spectroscopic and quantum chemical studies.* Pradeep K. Sengupta, Biswa P Pahari, Sandipan Chakraborty, Sudip Chaudhuri, **Bidisha Sengupta.** ***Chemistry and Physics of Lipids*** 165 (2012) 488– 496.

17. DNA Sensing by Amplifying the Number of Near-Infrared Emitting, Oligonucleotide-Encapsulated Silver Clusters. Jeffrey T. Petty, **Bidisha Sengupta**, Sandra P. Story, and Natalya N. Degtyareva ***Anal. Chem.*** 83 (15) (2011) 5957-5964.

18. *Optically-Enhanced, Near-IR, Silver Cluster Emission Altered by Single Base Changes in the DNA Template.* Jeffrey T. Petty, Chaoyang Fan, Sandra P. Story, **Bidisha Sengupta**, Matthew Sartin, Jung-Cheng Hsiang, Joseph W. Perry, and Robert M. Dickson. ***J. Phys. Chem. B,*** 2011, 115 (24), 7996–8003.

19. *DNA Encapsulation of 10 Silver Atoms Producing a Bright, Modulatable, Near-Infrared-Emitting Cluster*. Jeffrey T. Petty, Chaoyang Fan, Sandra P. Story, **Bidisha Sengupta**, Ashlee St. John Iyer, Zachary Prudowsky and Robert M. Dickson. ***J. Phys. Chem. Lett.*** 1 (2010) 2524–2529.

20. *DNA Templates for Fluorescent Silver Clusters and I-Motif folding*. **Bidisha Sengupta**, Kerianne Springer, Jenna Buckman, Sandra Story, Henry Oluwamuyiwa, Zahiyah Hasan, Zachary Prudowsky, Sheldon Rudisill, Natalya Degtyareva, Jeff Petty, ***J. Phys. Chem. C*** 113 (45) (2009) 19518-19524.

21. *Ag^+ Mediated Assembly of 5'-Guanosine Monophosphate*. Kristine Loo, Natalya Degtyreva, Jihae Park, **Bidisha Sengupta**, Andrea Bryant, Michael Reddish, Christopher Johnson, and Jeffrey T. Petty ***J. Phys. Chem. B*** *114* (12) (2010) 4320–4326.

22. *Context Dependence of Trinucleotide Repeat Structures.* Natalya Degtyreva, Courtney Barber, **Bidisha Sengupta** and Jeffrey T. Petty. ***Biochemistry*** *49* (14) (2010) 3024–3030.

23. *Structural studies of a trinucleotide repeat sequence using 2-Aminopurine*. Natalya Degtyareva, Michael Reddish, **Bidisha Sengupta** and Jeff Petty, ***Biochemistry*** 48 (11) (2009) 2340-2346.

24. *Base-Directed formation of fluorescent silver clusters.* **Bidisha Sengupta**, Caroline M. Ritchie, Kenneth Johnsen, Jenna Buckman and Jeffrey T. Petty, ***J. Phys.Chem. C***. 112 (48) (2008) 18776–18782.

25. *Ground and excited sate proton transfer and antioxidant activity of 3- hydroxyflavone in egg yolk phosphatidylcholine liposomes: absorption and fluorescence spectroscopic studies*. Sudip Chaudhuri, Kaushik Basu, **Bidisa Sengupta**, Anwesha Banerjee, and Pradeep K. Sengupta, ***Luminescence*** 23(6) (2008) 397 – 403.

26. *Effect of glycation on the structure and dynamics of DNA: A critical spectroscopic approach*. **Bidisa Sengupta**, Takashi Uematsu, Per Jacobsson and Jan Swenson, ***J. Phys. Chem. B.*** 111*(3) (2007) 646-651*.

27. *Interaction of flavonoids with red blood cell membrane lipids and proteins: Antioxidant and antihemolytic effects.* Sudip Chaudhuri, Anwesha Banerjee, Kaushik Basu**, Bidisa Sengupta**, Pradeep K. Sengupta***, Int. J. Biol. Macromol.*** 41 (2007) 41–48.

28. *Exploring the interactions of therapeutically active plant flavonoids with biological targets: Insights from fluorescence spectroscopy*. Pradeep K Sengupta, Anwesha Banerjee and **Bidisa Sengupta**, ***Photo/electrochemistry & Photobiology in Environment, Energy, and Fuel,*** (2006) 207-227.

29. *Encapsulation of Prodan in beta-cyclodextrin environments: An experimental and theoretical study via electronic spectroscopy and molecular mechanics.* Anwesha Banerjee, **Bidisa Sengupta**, Sudip Chaudhuri, Kaushik Basu, and Pradeep K Sengupta ***J. Mol. Struct.*** 794 (2006) 181-189.

30. *Exploring the antioxidant property of bioflavonoid quercetin in preventing DNA glycation: A calorimetric and spectroscopic study***. Bidisa Sengupta**, Takashi Uematsu, Per Jacobsson and Jan Swenson, ***Biochem. Biophys. Res. Commun.*** 339 (2006) 355- 361.

31. *Properties of normal and glycated human hemoglobin in presence and absence of antioxidant*. **Bidisa Sengupta** and Jan Swenson, ***Biochem Biophys. Res. Commun.*** 334 (2005) 954-959.

32. *Interactions of the plant flavonoid fisetin with macromolecular targets. Insights from fluorescence spectroscopic studies*. **Bidisa Sengupta**, Anwesha Banerjee, and Pradeep K. Sengupta, ***J. Photochem. Photobiol. B***, 80 (2005) 79-86.

33. *Protein-flavonol interactions: Insights from spectroscopic studies.* **Bidisa Sengupta**, Anwesha Banerjee, and Pradeep K. Sengupta, ***Proceedings of the International Seminar on Frontiers of Basic and Applied Molecular Biology,*** (2005) 26-31.

34. *Investigations on the binding and antioxidant properties of the plant flavonoid fisetin in model biomembranes.* **Bidisa Sengupta**, Anwesha Banerjee, and Pradeep K. Sengupta, ***FEBS Letters,*** 570 (2004) 77-81.

35. *Characterization of serotonin in protein and membrane mimetic environments: A spectroscopic study*. **Bidisa Sengupta**, Sudip Chaudhuri, Anwesha Banerjee and Pradeep K. Sengupta, ***Chemistry and Biodiversity***, 1 (2004) 868-877.

36. *Binding of quercetin with human serum albumin: A critical spectroscopic study*. **Bidisa Sengupta** and Pradeep K. Sengupta. ***Biopolymers (Biospectroscopy)*** 72 (2003) 427-434.

37. *Perspectives on some newly emerging luminescence probes for proteins and biomembranes.* **Bidisa Sengupta** and Pradeep K. Sengupta. in ***Recent Trends in Biophysical Research****'*, (ed. M. Maiti, G. S. Kumar, S. Das), publisher; Double a Work Station, Kolkata, (2003) 90-99.

38. *The interaction of Quercetin with Human Serum Albumin: A fluorescence spectroscopic study*. **Bidisa Sengupta** and Pradeep K. Sengupta. ***Biochem. Biophys. Res. Commun***., 299 (2002) 400-403.

39. *Low temperature luminescence behaviours of 7-azatryptophan, 5-hydroxytryptophan and their chromophoric moieties.* **Bidisa Sengupta**, Jayanti Guharay, Ajoy Chakraborty and Pradeep K. Sengupta. ***Spectrochim. Acta Part A (Biomolecular Spectroscopy Section)***, 58 (2002) 2005-2012.

40. *Flavonols as novel fluorescence probes: perspectives and emerging frontiers.* **Bidisa Sengupta** and Pradeep K. Sengupta. ***Indian Photobiology Society News Letter*** 41 (2002) 54-60.

41. *Studies on the interaction of quercetin with bovine serum albumin: A fluorescence spectroscopic approach.* **Bidisa Sengupta** and Pradeep K. Sengupta. ***Proceedings of the National Seminar on Recent Advances in Molecular Physiology***, Kalyani University, Feb 4-6, 2002. Page 151-155.

42. Protein - flavonol interaction: a fluorescence spectroscopic study. Jayanti Guharay, **Bidisa Sengupta** and Pradeep K. Sengupta, ***Proteins: Structure, Function and Genetics*** 43 (2001) 75-81.

43. *5-hydroxyindole: Usefulness as a novel optical probe*. **Bidisa Sengupta**, Jayanti Guharay and P. K. Sengupta. ***J. Mol. Struct.*** 559 (2001) 347-353.

44. *Influence of reverse micellar environments on the fluorescence emission properties of tryptophan octyl ester*. **Bidisa Sengupta** and Pradeep K. Sengupta, ***Biochem Biophys. Res. Commun.*** 277 (2000) 13-19.

45. *Characterization of the fluorescence emission properties of prodan in different reverse micellar environments.* **Bidisa Sengupta**, Jayanti Guharay and P. K. Sengupta. ***Spectrochim. Acta Part A (Biomolecular Spectroscopy Section),*** 56 (2000) 1433 – 1441.

46. *Luminescence behaviour of 5-hydroxyindole in different environments.* **Bidisa** Sengupta, Jayanti Guharay and P. K. Sengupta. ***Spectrochim. Acta Part A (Biomolecular Spectroscopy Section),*** 56 (2000) 1213 – 1221.

47. *Reverse micelles of TX-100 in mixed solvents of Benzene and n-Hexane: Fluorescence studies using 7HF as probe.* **Bidisa Sengupta**, Jayanti Guharay and Pradeep K. Sengupta, ***J. Surface Science and Technology***, 14 (1998) 150 – 156.

48. *An assessment of the usefulness of 5-hydroxytryptophan as an optical probe*. Jayanti Guharay, **Bidisa Sengupta** and Pradeep K. Sengupta, ***Spectrochim. Acta Part A (Biomolecular Spectroscopy Section),*** 54 (1998)185 - 190.

Selected Conferences attended for invited lectures, and oral presentations:

i. Mississippi Academy of Science 2012-2019
ii. Southern Biomedical Engineering Conference 2017, 2019
iii. ACS meeting 2011, 2012, 2013
iv. I-APS meeting 2014, 2015
v. MS Biophysics Consortium, 2014, 2015, 2018.
vi. 14th Southern School on Computational Chemistry and Material Science, 2014, 2018.
vii. MS-EPSCoR meeting at USM April, 2013

Selected Honors, Awards and Achievements:

i. Research Slated and Highlighted in the "Mississippi Link" Newspaper in September 2017.
ii. Nominated for "The Higher Education Appreciation Day, Working for Academic Excellence (HEADWAE)" award by the Natural Science Division of Tougaloo College. Award day: Feb 20, 2018.
iii. Research Initiation Award PI NSF $300000 (3 years)
iv. Target Infusion Award Co-PI NSF $400000 (2 years)
v. MS-INBRE Award PI $132000 (2 years)
vi. Seed grant award for Biomedical Research from NIH-INBRE (MS, 2013-2017).

vii. Seed grant award for Computational Chemistry Research from NSF-EPSCoR (MS, 2013-2016).
viii. Travel Award from NSF/AAAS for international research collaborations.
ix. The Hendrix W.K. Angad-Gaur Award, for excellence and innovation in Teaching, by Tougaloo College
x. Selected for **Marquis Who's Who in Science and Engineering, 2006-2007** and reselected in 2007-2008.
xi. **Received Best Poster Award** in the "**International Seminar** on Frontiers of Basic and Applied Molecular Biology", organized by Department of Biophysics, Molecular Biology & Genetics & University Science Instrumentation Centre, University of Calcutta (Jan 9-11, 2003).
xii. Recipient of very competitive fellowship from **Swedish Foundation for Strategic Research** for postdoctoral research.
xiii. Received **National Scholarship and Certificates of Merit at B.S. (Chem. Honors Major)**.
xiv. Awarded **Junior Research Fellowship** from **University Grants Commission,** India on 1994.
xv. Qualified Graduate Aptitude Test in Engineering (1994, Conducted by Indian Institute of Technology), India.
xvi. Awarded **Senior Research Fellowship** from Saha Institute of Nuclear Physics (SINP), India to perform research for Ph.D through a peer review process paneled by judges recognized all over India in the field of Biophysical sciences.

Peer Reviewer of International Journals:

Journal of Luminescence, Journal of Photochemistry and Photobiology B., International Journal of Biological Macromolecules, The Protein Journal, Journal of Physical Chemistry, Spectrochimica Acta, Luminescence: The Journal of Biological and Chemical Luminescence
Journal of Molecular Structure, RSC Advances, Analytical letters

Teaching Experience:

January 2011-present Teaching Organic Chemistry I, II, laboratory, Biochemistry with laboratory, Senior Seminar, Instrumental Analysis, Introduction to Chemistry courses.

2006-2010 Supervised undergraduate and M.S. Students in the daily research work in the laboratory of Prof. Jeffrey T. Petty, at Furman University.

2001-2004 Teaching and conduction of practical course works of post-M.Sc. (Bioscience) students of SINP, Kolkata, and project works of short term visiting students from universities (of both undergraduate and postgraduate levels), in the laboratory of Prof. P. K. Sengupta, at Biophysics Division, SINP, Kolkata.

2000 Part time honorary lecturer of the biophysical and molecular biological courses of Microbiology at R.G. Surendranath College, Kolkata, India.

Membership of Professional Association:

1. American Association for the Advancement of Sciences (AAAS)
2. American Chemical Society (ACS)
3. Indian Biophysical Society (IBS)
4. Indian Society for Radiation and Photochemical Sciences (ISRAPS)
5. Sigma Xi

Technical Skills and Expertise:

BIOMOLECULAR SPECTROSCOPY

1. UV/visible absorption
2. Fluorescence (steady state and time resolved)
3. Fourier transform infrared spectroscopy
4. Circular Dichroism (CD)
5. Photon correlation (Dynamic Light Scattering)
6. Dielectric spectroscopy
7. Mass Spectrometry

CALORIMETRY

1. Differential scanning
2. Isothermal Titration Calorimetry

BIOCHEMISTRY

1. Gel electrophoresis
2. Gel filtration chromatography, HPLC/SEC
3. Mammalian cell cultures, assays

MICROSCOPY

Phase contrast, light and electron microscopy

Research area:

Bidisha Sengupta, Ph.D

Bio-Physical Chemistry and Nano-Science Group

At Chemistry Department, Tougaloo College we are pursuing research studies which encompass two main themes of contemporary interest:

1. ***Studies on the antioxidative properties of plant flavonoids in preventing oxidative stress in biological systems including macromolecules (DNA, peptides), mammalian cells (cancer, lymphoblast cells):***

We have fruitfully exploited the exquisitely sensitive intrinsic fluorescence emission properties of plant flavonoids which possess potential anti-oxidant, anti-cancer, anti-AIDS and other important therapeutic properties with high potency and low systematic toxicity, to explore their interactions with physiologically relevant targets viz proteins, amyloid peptides, DNA, biomembranes and encapsulation in nano-cavities of cyclodextrin based drug delivery vehicles. We found that the flavonoid molecules bind with two distinct sites in human serum albumin, while in membranes they are localized at the interfacial regions. Flavonoids are found to intercalate in DNA. Such works would lead to new avenues for examining 'structure-activity' relationships and 'screening' of flavonoid derivatives with desired therapeutic properties and also provide insights toward future goals for developing effective drug delivery strategies.

2. ***DNA Templates for Fluorescent Silver Clusters:***

We are involved in the development of novel nonmaterials, which are very useful in bio imaging. Silver nanoclusters are a new class of fluorescent labels in biology. I am studying the properties of different sequences of DNA encapsulated, brightly fluorescing photo-activated silver

nanoclusters that have much brighter and more robust emission than organic dye molecules.

3. *Studies on Protein/Peptide misfolding and aggregation:*

The major goals are looking at the influence of neurotransmitters, plant flavonols and tubulin protein on the rate of aggregation of amyloid beta (abeta) peptides. Aggregation takes place after the peptides are unfolded and the secondary structure does not exist. Hence, we want to discover ways to stabilize the secondary structure of the peptides.

Predoctoral Studies:

During this period, I worked with various **bio-relevant** molecules including neuro hormones, intrinsic as well as extrinsic optical probes (e.g. tryptophan analogs, prodan respectively) for structure, function and dynamics of proteins and biomembranes. My studies have revealed important (electronic excited state) relaxation pathways and novel luminescence properties of these compounds. In particular, the promising potential of various indole derivatives as highly sensitive monitors of water restricted environments at biomembrane interfaces, occurrence of red edge excitation shifts (REES) in extrinsic probes like prodan and the use of such compounds as probes for exploring structural changes (e.g. gel to liquid crystalline state phase transitions) in membrane mimetic organized assemblies, were demonstrated for the **first time**. Our research on newly emerging probes showed the promising potential of tryptophan octyl ester (TOE) as a sensitive probe for membrane proteins, appropriate for exploring water restricted environments at biomembrane interfaces, as inferred from meticulous studies using reverse micelles as model systems. For 5-hydroxyindole (the chromophoric moiety of 5-hydroxytryptophan, the precursor amino acid of the physiologically active neuro hormone, Serotonin) novel applications as an extrinsic probe for proteins and model membranes (liposomes) were shown, using fluorescence anisotropy as a sensitive parameter.