

Curriculum Vita

Dr. Angana Sarkar

Assistant Professor

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Research Interest:

Environmental Biotechnology

Metagenomics

Bioremediation

Geochemical cycle of heavy metals

Microbe-metal interactions

Biosensor Technology for Heavy metal detection

Waste management

Bio-refinery approach for Waste to value/energy production

Academic Qualifications:

Sl No.	Degree	Institution	Year	Divission /Class
1	B.Tech (Agril. Engg.)	Bidhan Chandra Krishi Viswavidyalaya	2005	1 st
2	M.Tech (Biotech and Biochemical Engg.)	Indian Institute of Technology, Kharagpur	2008	1 st
3	PhD(Environmental Biotechnology)	Indian Institute of Technology, Kharagpur	2014	NA

Employment Experience

S.N o.	Position and Organisation	Nature of Job	Period
1	Research Associate, IIT Kharagpur and CSIR	Research	March 2013-June 2015
2	Assistant Professor, NIT Rourkela	Teaching and Research	July 2015 to till date

Awards and achievements:

- University Merit Fellowship (From 2001-2005)
- Graduate Aptitude Test in Engineering (GATE) 2004
- Graduate Aptitude Test in Engineering (GATE) 2003, AIR-115
- Institute Research Fellow, Indian Institute of Technology Kharagpur, 2008

- Research Associate fellow, Council of scientific and Industrial Research (CSIR), India, 2013

List of Publications

Journal Publications:

- **Sarkar A**, Kazy SK, Sar P (2012), Characterization of arsenic resistant bacteria from arsenic rich groundwater of West Bengal. *Ecotoxicology* 22: 366-374.
- **Sarkar A**, Kazy SK, Sar P (2014), Studies on arsenic transforming groundwater bacteria and their role in arsenic release from subsurface sediment. *Environmental Science and Pollution Research* 21:8645-8662.
- **Sarkar A** and Sar P. (2015) Horizontal gene transfer of *ars* genes: A possible source of arsenic dissemination in subsurface environment. *Journal of Environmental Research and Development (JERAD)* 9:803-812.
- **Sarkar A**, Paul D, Kazy SK, Sar P (2015), Molecular analysis of microbial community in arsenic rich groundwater of Kolsur, West Bengal. *Environmental Science and Health Part A*. Accepted.
- **Sarkar A**, Sar P, E Islam (2016) Hexavalent Chromium Reduction by *Microbacterium oleivorans* A1: A Possible Mechanism of Chromate -Detoxification and –Bioremediation. **Recent Patents on Biotechnology**, 9(2): 116-129.
- Mohapatra, B, **Sarkar A**, Joshi S, Chatterjee A, Kazy SK, Maiti M K, Satyanarayana T, and Sar P. "An arsenate-reducing and alkane-metabolizing novel bacterium, *Rhizobium arsenicireducens* sp. nov., isolated from arsenic-rich groundwater." *Archives of Microbiology* (2016): 1-11.

Conference publication:

- **Sarkar, A.**, Kazy, SK, Sar, P. 2011. Geomicrobiology of arsenic release in subsurface groundwater: a molecular microbiology approach. International Conference on Sustainable Water Resources Management and Climate Change Adaption. NIT Durgapur. ISBN: 978-93-80663-13-5, 265–278.
- Sar, P., Paul, D., **Sarkar, A.**, Kazy SK. 2014. Microbiology of arsenic contaminated groundwater. Souvenir & Mini Reviews in Proceeding of 55th Annual Conference on National Conference on Empowering Mankind with Microbial Technologies (AMI-EMMT-2014) organized by Association of Microbiologists of India (AMI), November 12nd -14th, Tamil Nadu Agricultural University, Coimbatore, 41-46.
- **Sarkar, A.**, Kazy, SK, Sar, P. 2011. Geomicrobiology of arsenic release in subsurface groundwater: a molecular microbiology approach. International Conference on Sustainable Water Resources Management and Climate Change Adaption. February17-19, NIT Durgapur, West Bengal, India.
- **Sarkar, A.**, Sar P. (2012) An investigation on arsenite oxidizing bacteria and arsenite oxidase gene (*aoxB*) in terms of evaluating their potential for groundwater arsenic bioremediation. Proceeding of 53rd Annual Conference of Association of Microbiologists of India (AMI), November 22nd -25th, KIT university, Bhubaneswar, Odisha.
- Paul, D., **Sarkar, A.**, Gupta, K.A. (2010). Molecular analysis of microbial diversity and community structure at arsenic contaminated ground water of West Bengal: culture-dependent and metagenomic approaches, Golden jubilee symposium on contemporary trends in plant and microbial sciences, March 19-20, Burdwan University, Burdwan, West Bengal, India.
- Paul, D., **Sarkar, A.**, Kazy, S.K., Sar, P. (2012). Bacterial community structure and composition in high arsenic contaminated ground water from West Bengal and microbial

role in subsurface arsenic release. Proceeding of 14th International Conference of Microbial Ecology, August 19-24, Copenhagen, Denmark.

- Paul, D., **Sarkar, A.**, Kazy, S.K., Sar, P. (2012). Analysis of microbial community structure and function in arsenic contaminated ground water of West Bengal, India. Proceeding of Joint Genome Institute workshop in Genomics and Metagenomics, September 10–14, Walnut Creek, California, USA.
- Sar, P., Paul, D., **Sarkar, A.**, Kazy, S.K., Gupta, K.A., (2014). Culturable bacterial diversity, metabolic activity and role in arsenic mobilization in groundwater of West Bengal, India. Proceeding of 15th International Conference of Microbial Ecology, August 24-29, Seoul, South Korea.
- Mahapatra, B., **Sarkar, A.**, Sar P. (2014) *Rhizobium* sp. novel: an n-alkane degrading dissimilatory arsenate respiring bacterium isolated from arsenic contaminated groundwater of West Bengal, India. Proceeding of 55th Annual Conference on National Conference on Empowering Mankind with Microbial Technologies (AMI-EMMT-2014) organized by Association of Microbiologists of India (AMI), November 12nd -14th, Tamil Nadu Agricultural University, Coimbatore.
- **Sarkar A** and Sar P. (2014) Horizontal gene transfer of *ars* genes: A possible source of arsenic dissemination in subsurface environment. Journal of Environmental Research and Development (JERAD). Proceeding of 7th International Congress of Environmental Research (ICER-14) organized by R.V. college of Engineering, Bangalore India, in collaboration with Journal of Environmental Research and Development, Bhopal, December 26-28, 2014.
- **Sarkar A** and Sar P. (2015), Isolation and characterization of arsenite-oxidizing bacteria from arsenic contaminated groundwater to evaluate their potential in arsenic bioremediation. Proceeding of 2nd International Conference on Frontiers in Biological Science (InCoFIBS-2015), organized by Department of Life Science, National Institute of Technology, Rourkela, Odisha, India, January, 22-24, 2015.
- **Sarkar A**, Kazy SK, Roy A and Sar P (2015), Molecular characterization and optimization of arsenite oxidation by *Achromobacter* sp. strain KAs3-5: potential for groundwater arsenic bioremediation. New Horizon in biotechnology (NHBT-2015). Trivandrum, India, November 22-25, 2015.
- Biswas R and **Sarkar A** (2017) Isolation and characterization of arsenite oxidizing strains for their potential in arsenic bioremediation. Submitted to the upcoming conference, National Conference on Waste to Energy, Carbon Capture and Storage [NCWECCS-2017], National Institute of Technology Rourkela, Odisha during 3-5 August 2017.
- Gupta K, Maurya V, **Sarkar A** (2017) Advancement of omics: New era in waste management. Submitted to the upcoming conference, National Conference on Waste to Energy, Carbon Capture and Storage [NCWECCS-2017], National Institute of Technology Rourkela, Odisha during 3-5 August 2017.
- Biswas R and **Sarkar A** (2017) Isolation and characterization of arsenite oxidizing bacteria for their potential application in arsenic bioremediation from contaminated ground water. International Conference on Challenges in Environmental Science & Engineering CESE-2017, Kunming, China, 11-15 November 2017.
- Gupta K, Biswas R, Maurya V, **Sarkar A** (2017) Advancement of omics: Future prospects for bioremediation of contaminated soils. International Conference on Challenges in Environmental Science & Engineering CESE-2017, Kunming, China, 11-15 November 2017.

Books Published /Chapters contributed

- Sar, P., Kazy, S.K., Paul, D., **Sarkar, A.**, 2012. "Metal bioremediation by thermophilic microorganisms" in Thermophiles in Environmental Biotechnology, Satyanarayana, T., et al. (Eds) Springer science, New York, pp. 171–200. ISBN 978-94-007-5899-5.

- Sar P, Paul D, **Sarkar A**, Bharadwaj R, Kazy SK., 2014. "Microbiology of arsenic contaminated groundwater" in Microbiology for Minerals, Metals, Materials and Environment, Pandey A, B.D. and Natarajan K.A., (Eds) CRC Press, (ISBN 9781482257298) Chapter 19, pp.478-525.
- Sar, P, Mohapatra, B, Ghosh, S, Paul, D, **Sarkar A**, and Kazy S K. "Geomicrobiology of Arsenic-Contaminated Groundwater of Bengal Delta Plain." In *Handbook of Metal-Microbe Interactions and Bioremediation*, pp. 333-353. CRC Press, 2017.
- **Sarkar A** and Biswas R,(2017) Application of "Omics" tools in Soil microbiology: The state of the art. Accepted in Springer publication.
- **Sarkar A**, Gupta N, Kamari N, Gupta K (2017), Microbial interaction with metals and metalloids: a prospective clean environment. Accepted in Springer publication

Professional Training & Experience:

- Teaching Assistant in Microbiology, Molecular biotechnology and Bioinformatics class in Dept. of Biotechnology, IIT-Kharagpur, 2008 -2014.
- Assistance in the management event of QIP Short term course sponsored by AICTE on "**Environmental Genomics and Biotechnology**" offered by IIT Kharagpur. December 2nd – 9th, 2011.
- Worked as Instructor at the National workshop on Bioinformatics in "**Genomics and Proteomics**", Dept. of Biotechnology, IIT – Kharagpur, 2009
- Worked as instructor in International Summer and Winter Term course on "**Genomics, Metagenomics and Metabolic Engineering**" from December 08- December 18, 2014 sponsored by IIT Kharagpur.
- Short Term Training Program on **APPLICATIONS OF BIOINFORMATICS IN BIOTECHNOLOGY(ABB-2016)** (17th February to 21st February 2016) as Co-covenor.
- Invited talk on Molecular tools required for the screening of organism and molecular characterization in **TEQIP-II sponsored STTP on Bioprocess Development, Reactor, design and Analysis**, NIT Raipur 12.01.2017

Sponsored Research Projects

S. No.	Title of Project	Funding Agency	Date of sanction and Duration
1	Molecular characterization of arsenic (As) transformation mechanisms of arsenite oxidizing bacteria isolated from contaminated groundwater of Bihar to elucidate their potential application in As bioremediation	DST	28.03.16, 3years
2	Exploitation of arsenite oxidizing bacteria in development of pH dependent bio-sensor for rapid arsenic detection	DST	Nov 24, 2016 3years
3	Construction of pH based arsenic bio-sensor using engineered arsenite oxidizing strain	<i>TEQIP Phase II</i>	26 th September,2016 1 year

Techniques known:

Microbiological and Molecular biological techniques: DNA isolation and purification from environmental sample (water, sediments and soil) and Bacteria. Polymerase chain reaction (PCR), *Restriction fragment length polymorphism* (RFLP) fingerprinting, Denaturing Gradient Gel Electrophoresis (DGGE) fingerprinting, *Amplified Ribosomal DNA Restriction Analysis*(ARDRA), Agarose and *Polyacrylamide* gel electrophoresis (PAGE), Gel purification, PCR purification, Plasmid isolation, Cloning and transformation, Restriction digestion and DNA sequencing and sequence analysis, Metagenome analysis, Isolation of pure cultures, 16S rRNA gene analysis, Microbial culture characterization, Microbiological techniques, Enrichment, isolation, identification and characterization of bacteria, Biochemical and 16SrRNA based identification of bacteria, PCR-based molecular phylogenetic analyses and identification of microbes using ribosomal RNA genes. Study of gene expression levels by real time PCR, Proteomic analysis by 2D GEL Electrophoresis.

High throughput Instruments used:

Scanning electron microscope (SEM), Energy Dispersive Spectrometer (EDS/EDAX), X-ray diffractometer (XRD), Atomic absorption spectrophotometer (AAS), X-ray fluorescence (XRF) spectrometer, Inductively coupled plasma mass spectrophotometer (ICP-MS), 2D Gel electrophoresis instrument, Phase contrast microscope, Bright field and fluorescence microscope, Gradient Thermo-Cycler, *Real-time PCR Machine*, *Capillary Sequencing Machine*, Gas Chromatography (GC).

Bioinformatics: Expertise in Phylogenetic analysis in various phylogenetic tool packages [NCBI tool kit, Bioinformatics related to genomics specially Skills in BioEdit, MEGA 5, *Interactive Tree Of Life (ITOL)*, *Ez Taxon* etc.], *Sequence chromatogram analysis using Chromas*, Ribosomal Database Project (RDP) tool kit, Greengenes tools, Genome Online Database (GOLD), Analysis of protein structure and conserved domain using online packages (ESPrpt, *ExPASy*, *PSIPRED*, etc.). *Design of primers (Primer3, NCBI Primer design tools etc.)*, *Next Generation Sequencing (NGS) analysis (using CHIME, RAST, MGRAST etc.)*, *Whole Genome Sequencing analysis*.

Statistical software packages: Origin, Statistical Package for the Social Sciences (SPSS) and MultiVariate Statistical Package (MVSP).