

**Invited Lecture, 3 rd Asian Conference on Chemosensors and Imaging Probes
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Novel aspects of Calixarene chemistry: Sensing and bio-imaging applications

Prof. V. K. Jain

*Department of Chemistry, School of sciences, Gujarat University,
Ahmedabad 380009, Gujarat, India
Email: drvkjain@hotmail.com*

Abstract

Calixarene chemistry has developed into major research fields of contemporary sciences due to the ease in the synthesis of the basic platform and ready functionalization at the lower and upper rims to construct variously modified three-dimensional structures. In the same context, our research group have explored oxacalix[4]arenes, thiacalix[4]arenes, resorcinarenes and calix[4]pyrroles for some fascinating applications such sensors for metal ions, pesticides and nitroaromatic compounds. We have also explored these calixarene platforms as both reducing as well as stabilizing agent for the preparation of gold, silver, palladium and platinum nanoparticles. The nanoparticles have shown sensing as well as catalytic applicability for organic chemical reactions: Suzuki, Heck, Sonogashira and Stille reactions. In one of our research works, we have explored oxacalix[4]arene based silver nanoparticles as colorimetric sensor for methyl mercury (CH_3Hg^+) in aqueous medium in the presence of various metal ions. Considering the biological importance for the recognition of methylmercury, especially in living organism/cell, we have performed bio-imaging in an aquatic crustacean *artemiasalina*, a species of brine shrimp. These shrimps when exposed in organic mercury solutions, shows strong fluorescent ascertains the presence of mercury in solution. We have also studied other biological applications such as antimicrobial and cytotoxic agent using calix-based nanoparticles which can form a future basis for their potential use in new pharmaceutical formulations.

Reference:

1. Oguz, Mehmet, et al. "New water soluble Hg^{2+} selective fluorescent calix [4] arenes: Synthesis and application in living cells imaging." *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* 171 (2017): 340-345.
2. V K Jain, et al. "Dual in vitro and in silico analysis of thiacalix [4] arene dinaphthalene sulfonate for the sensing of 4-nitrotoluene and 2, 3-dinitrotoluene." *New Journal of Chemistry* 42.4 (2018): 2682-2691.
3. V K Jain, et al. "Heterogeneous hydrogenation using stable and reusable calix [4] pyrrole fenced Pt nanoparticles and its mechanistic insight." *Applied Surface Science* 437 (2018): 195-201.

Name: Dr. V.K. Jain

Designation: Professor & Head

Department of Chemistry

School of Sciences, Gujarat University

Ahmedabad-380009 (Gujarat, INDIA)



Prof. V.K. Jain, received his bachelors in Chemistry Honors (1980) and Masters of Science in Inorganic Chemistry (1982) and PhD (1989) from University of Delhi. He qualified N.E.T. in 1988. Joined as Lecturer in the Chemistry Department in the School of Sciences at Gujarat University in 1991 and became Professor in March 2007. With 28 years of Post Graduate teaching experience at Gujarat University, he has successfully guided 16 students through their Ph. D and has four students working under his supervision at present. He has 75 research articles and four review articles in International Journals to his credit. He has more than 1700 citations with an h-index of 21 and i-10 index of 42.

In addition, he has completed many **Major research projects from** UGC; GUJCOST (DST) Gujarat, DRDO and CSIR, New Delhi. Currently, he is handling major research project from DST-SERB and also acting as the Co-ordinator of UGC DSA-DRS phase III program on “Supramolecules and Nano Materials”. He is also the co-author of the book entitled Group Theory and Symmetry in Chemistry. He has organized, participated and presented his research work in various national and international conferences in India and has also had the opportunity to present his work abroad (Missourie 2005, Chicago 2008 and Washington DC 2016). He is also a referee for various reputed International Journals. He is also a member of various academic and professional bodies.

PROFESSIONAL MEMBERSHIPS / AFFILIATIONS

- Member (2017-2019) of subject matter expert (Environmental Quality) of the Expert Appraisal Committee for appraisal of Infrastructure, CRZ and other miscellaneous projects for Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India, New Delhi.
- Member (2014-17 and 2017-2020) of State Level Expert Appraisal Committee (SEAC) for Gujarat State, (MoEF&CC), Government of India, New Delhi.
- Member, Doctoral Studies (2015-18), Gujarat Forensic Sciences University, Gandhinagar.
- Council member (2011-2014-17) and Member of Chemical Research Society of India, Bangalore.
- Co-convener, Ahmedabad-Local Chapter of Chemical Research Society of India.
- Fellow of Indian Chemical Society. Fellow Gujarat Science Academy. Life Member of Indian Science Congress, Association of Indian Analytical Scientists. Institution of Chemist, Association of Chemistry Teachers and National academy of Sciences.
- Member of Board of Studies, Research Progress Committees and examiners in various reputed Universities.
- **Area of interest and specialization:** To design, synthesize and characterize new functionalized supramolecular chemosensors derived from Calixpyrroles, Calix[4]resorcinarenes, Oxacalixarene, Azacalixarene and Thiacalixarenes. To study their binding behaviour towards various analytes (toxic and trace cations, anions, biomolecules, **explosives, chemical warfare agents** and pesticides etc.) in environmental and biological samples.
- As Convener, recently organised Indo-US workshop on Vulnerability Assessment for Weaponizable Dual Purpose Chemicals” in 2016 at Hyderabad; Security of Dual Use Agrochemicals (Improving Security at Vulnerable Locations in the Agrochemical Supply Chain in 2017 at Ahmedabad and on Safeguarding Dual-Use Chemicals: The Application of Vulnerability Assessment Tools and Risk-Based Security Enhancements in 2018 at Chandigarh. Workshops on Strengthening Supply Chain Security during 10-11 July 2019, International Conference on Climate Change Impacts Management (CCIM2019) on 5th & 6th August 2019 and Asian Network for Natural and Unnatural materials (ANNUM7) during 26-29th September 2019 have also been organised under the patronages of Gujarat University at Ahmedabad, Gujarat.