



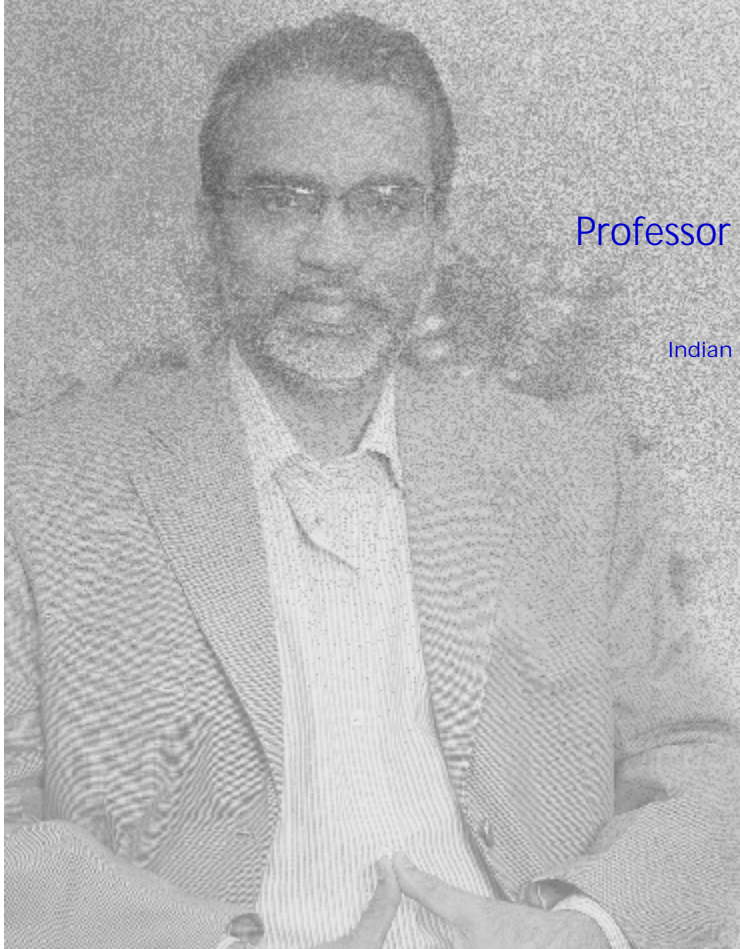
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COUNCIL OF SCIENTIFIC
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Professor Thalappil Pradeep

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Thematic Unit of Excellence
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50 Years of Service to the Nation



Professor Thalappil Pradeep

T. Pradeep is a professor of Chemistry at the Indian Institute of Technology Madras, Chennai, India. He earned his Ph.D. from the Indian Institute of Science in 1991 and had post doctoral training at the Lawrence Berkeley Laboratory, University of California, Berkeley and Purdue University, West Lafayette. He held visiting positions at many leading universities and institutes in Asia and Europe. Prof. Pradeep's research interests are in molecular and nanoscale materials and he develops instrumentation for such

studies. He has authored over 330 scientific papers in journals and is an inventor of over 65 patents or patent applications. He is involved in the development of affordable technologies for drinking water purification and some of his technologies have been commercialized. His pesticide removal technology has been incorporated in about one million filters. Along with his associates, he has incubated two companies and one of them has a production unit. His technology is delivering arsenic free water to 400,000 people already and will reach 600,000 people by the year end. He is a recipient of several awards including the Shanti Swaroop Bhatnagar Prize, BM Birla Science Prize, National Award for Nanoscience and Nanotechnology, India Nanotech Innovation Award and JC Bose National Fellowship. He is an adjunct professor at the Institute of Life Sciences, Ahmedabad University, Ahmedabad, PSG Institutes of Advanced Study, Coimbatore and is also a member of the Graduate Faculty of Purdue University, USA. He is a Fellow of the Indian Academy of Sciences, Indian National Academy of Engineering and Royal Society of Chemistry. He is the author of the introductory textbook, *Nano: The Essentials* (McGraw-Hill) and is one of the authors of the monograph, *Nanofluids* (Wiley-Interscience) and an advanced textbook, *A Textbook of Nanoscience and Nanotechnology* (McGraw-Hill). He is on the editorial boards of journals such as *Nano Reviews*, *ACS Applied Materials & Interfaces*, *Particle*, *Surface Innovations*, *Chemistry-An Asian Journal*, *Nanoscale* and *Scientific Reports* and is an associate editor of the new American Chemical Society Journal, *ACS Sustainable Chemistry & Engineering*. His other interests include education, popularization of science and development of advanced teaching aids. He has authored a few popular science books in Malayalam and is the recipient of Kerala Sahitya Academi Award for knowledge literature for the year 2010. In 2015, he received the *Lifetime Achievement Research Award of IIT Madras* and is designated as *Institute Professor*. For more information, please see, <http://www.dstuns.iitm.ac.in/pradeep-research-group.php>.

Affordable point-of-use water purification using nanomaterials

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Access to clean water is one of the most important indicators of development. This water has to be affordable to make a meaningful impact to the society. Creation of affordable materials for constant release of silver ions in water is one of the most promising ways to provide microbially safe drinking water for all. Combining the capacity of diverse nanocomposites to scavenge toxic species such as arsenic, lead, and other contaminants along with the above capability can result in affordable, all-inclusive drinking water purifiers that can function without electricity. The critical problem in achieving this is the synthesis of stable materials that can release or adsorb ions continuously in the presence of complex species usually present in drinking water that deposit and cause scaling on nanomaterial surfaces. We have shown that such constant release/adsorbing materials can be synthesized in a simple and effective fashion in water itself without the use of electrical power. The nanocomposite exhibits river sand-like properties, such as higher shear strength in loose and wet forms. These materials have been used to develop an affordable water purifier to deliver clean drinking water at US \$2.5/y per family. The ability to prepare nanostructured compositions at near ambient temperature has wide relevance for adsorption-based water purification. We have implemented such solutions already in arsenic affected areas of India. In the next 12 months, we are expected to provide arsenic free water to 600,000 people. Experiences from such efforts will be discussed. Along with such removal methods, sensing at ultra-trace levels for contaminants in drinking water is also important. Recent efforts in this direction will be outlined.

References:

1. Biopolymer reinforced synthetic granular nanocomposites for affordable point-of-use water purification, M. Udhaya Sankar, Sahaja Aigal, Amrita Chaudhary, Anshup, Shihabudheen M. Maliyekkal, A. Anil Kumar, Kamalesh Chaudhari and T. Pradeep, *Proc. Natl. Acad. Sci.*, 110 (2013) 8459-8464.
2. Approaching sensitivity of tens of ions using atomically precise cluster-nanofiber composites, Atanu Ghosh, Vedhakkani Jeseentharani, Mohd Azhardin Ganayee, Rani Hemalatha, Kamalesh Chaudhari, Cherianath Vijayan and T. Pradeep, *Anal. Chem.*, 86 (2014) 10996–11001.
3. Supramolecular functionalization and concomitant enhancement in properties of Au₂₅ clusters, Ammu Mathew, Ganapati Natarajan, Lauri Lehtovaara, Hannu Häkkinen, Ravva Kumar, Venkatesan Subramanian, Abdul Jaleel, T. Pradeep, *ACS Nano*, 8 (2014) 139-152.
4. Selective visual detection of TNT at the sub-zeptomole level, Ammu Mathew, P. R. Sajanlal, and T. Pradeep, *Angew. Chem. Int. Ed.*, 51 (2012) 9596-9600.

For a complete list of papers, please visit: www.dstuns.iitm.ac.in/pradeep-research-group.php



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- Environmental Toxicology
- Regulatory Toxicology
- Nanotherapeutics & Nanomaterial Toxicology
- Systems Toxicology & Health Risk Assessment

Services Offered

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- NABL accredited
- Safety / toxicity evaluation of NCEs
- Water quality assessment and monitoring
- Analytical services
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- Epidemiological studies
- Information on chemicals / products

Recognitions

- Scientific & Industrial Research Organizations (SIROs)
- UP Pollution Control Board (Water & Air)
- Indian Factories Act (Drinking Water)
- Bureau of Indian Standards (Synthetic Detergents)
- Food Safety & Standards Authority of India (FSSAI)

Technologies Developed / Available

- Water Analysis Kit
- Mobile Laboratory Van for on spot water quality analysis
- Argemone Detection Kit for rapid screening of Argemone in mustard oil
- CD-Strip for detection of butter yellow, an adulterant in edible oils
- Arsenic Detection Kit



Director

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