INDIAN INSTITUTE OF TECHNOLOGY MANDI

भारतीय प्रौद्योगिकी संस्थान मंडी

Institute Colloquium

“Water, Droplets and Ice Examples of Science in Action”

Prof. T. Pradeep

Institute Professor

Indian Institute of Technology Madras

10th April, 2026

05:00 pm

Auditorium, North Campus

"Water, Droplets and Ice
Examples of Science in Action"

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Abstract: -

Sustainable nanotechnology is important for providing contaminant-free water to humanity. I will present the discovery of affordable and sustainable nanomaterials to selectively scavenge arsenate and arsenite ions (and others) in water to bring their concentrations below the drinking water limits and its development into a technology. The solution, popularly called AMRIT (meaning elixir in Sanskrit), is now delivering 80 million litres of arsenic-, iron- and uranium-free water every day, conforming to international standards to 1.3 million people at the cost of 2.1 paise (US$0.00026) per litre, lowest in the world. This technology has been approved for national implementation. We have developed several other technologies for sensing contaminants and their removal. A glimpse into these activities and directions for future will be presented.

The work on clean water is happening along with new chemistry in water droplets and science of ice where many surprises have come out in the recent past. A couple of examples will be presented.

Key papers:

Clean water through nanotechnology: Needs, gaps, and fulfillment, Ankit Nagar and T. Pradeep, ACS Nano, 14 (2020) 6420–6435. DOI: 10.1021/acsnano.9b01730

Confined metastable 2-line ferrihydrite for affordable point-of-use arsenic-free drinking water, A. A. Kumar, A. Som, P. Longo, C. Sudhakar, R. G. Bhuin, S. Sen Gupta, Anshup, M. U. Sankar, A. Chaudhary, R. Kumar, and T. Pradeep, Adv. Mater. 2017, 29, 1604260 (1-7). DOI: 10.1002/adma.201604260

Biopolymer reinforced synthetic granular nanocomposites for affordable point-of-use water purification, M. U. Sankar, S. Aigal, A. Chaudhary, Anshup, S. M. Maliyekkal, A. Anil Kumar, K. Chaudhari, and T. Pradeep, Proc. Natl. Acad. Sci., 110 (2013) 8459-8464. DOI: 10.1073/pnas.1220222110

Ambient microdroplet annealing of nanoparticles, Angshuman Ray Chowdhuri, B. K. Spoorthi, Biswajit Mondal, Paulami Bose, Sandeep Bose, and Thalappil Pradeep, Chem. Sci., 12 (2021) 6370–6377. DOI: 10.1039/d1sc00112d

Spontaneous weathering of natural minerals in charged water microdroplets makes nanomaterials, B. K. Spoorthi, Koyendrila Debnath, Pallab Basuri, Ankit Nagar, Umesh V. Waghmare, and Thalappil Pradeep, Science, 384 (2024) 1012-1017. DOI: 10.1126/science.adl3364

Nanosheet-to-nanoparticle transformation in charged water microdroplets: a pathway for 2D to 0D materials, B. K. Spoorthi, Angshuman Ray Chowdhuri, Biswajit Mondal, Sujan Manna, Anubhav Mahapatra, Amoghavarsha Ramachandra Kini and Thalappil Pradeep, Chem. Commun., 61 (2025) 5577-5580. DOI: 10.1039/D4CC06697A

From micro-to-nano in charged water microdroplets: Unveiling steps in the weathering of minerals, Anubhav Mahapatra, Anirban Som, B. K. Spoorthi, Depanjan Sarkar and Thalappil Pradeep, Chem. Comm., 61 (2025) 15846-15849. DOI:10.1039/D5CC02952J

Microdroplet mechanochemistry, Thalappil Pradeep, ACS Sustain. Chem. Eng., 14 (2026) 25-30. DOI: 10.1021/acssuschemeng.5c12102

Brief Biography: -

Prof. Thalappil Pradeep is an Institute Professor and Deepak Parekh Institute Chair Professor at the Indian Institute of Technology Madras (IITM), Chennai, India. His research interests are in molecular and nanoscale materials. He has authored 600+ scientific papers, 10 books, 100+ Indian and 30 US/PCT patents, cofounded 7 start-ups and founded the International Centre for Clean Water (https://iccw.world). He is involved in the development of affordable technologies for drinking water purification. His pesticide removal technology has reached >10 million people. His arsenic removal technology, approved for national implementation, is delivering arsenic free water to >1.4 million people every day. He is a recipient of recognitions including the Shanti Swaroop Bhatnagar Prize, The World Academy of Sciences (TWAS) prize, Padma Shri, Vigyan Shri, Nikkei Asia Prize, Prince Sultan Bin Abdulaziz International Prize for Water, VinFuture Prize and ENI award. He is a Fellow of all the science and engineering academies of India, TWAS, American Association for the Advancement of Science, African Academy of Sciences, US National Academy of Engineering and Academia Europaea. He has received the *Lifetime Achievement Research Award* of IITM and *Distinguished Alumnus Award* of Indian Institute of Science. As part of philanthropy, he supports a school in his village where 500 students are on rolls.