

RODDAM NARASIMHA DISTINGUISHED LECTURE

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CLEAN WATER USING ADVANCED MATERIALS: SCIENCE, INCUBATION AND INDUSTRY

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ABOUT THE SPEAKER

Thalappil Pradeep is an Institute Professor at the Indian Institute of Technology Madras, Chennai, India. He is the Deepak Parekh Institute Chair Professor and is also a Professor of Chemistry. He studied at IISc., UC Berkeley and Purdue. His research interests are in molecular and nanoscale materials and he develops instrumentation for such studies. He is an author of 382 scientific papers and over 75 patents or patent applications. In addition to the work on advanced materials, he is involved in the development of affordable technologies for drinking water purification and some of them have been commercialized. His pesticide removal technology is estimated to have reached about 7.5 million people. Along with his associates, he has incubated two companies and one of them has a production unit. His arsenic removal technology, approved for national implementation, has already reached about 600,000 people. 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 a Fellow of all the science and engineering academies of India and is a fellow of the Royal Society of Chemistry. He is a distinguished professor in a few institutions in India and is also on the graduate faculty of Purdue University. 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 several journals and is an associate editor of the American Chemical Society Journal, ACS Sustainable Chemistry & Engineering. He has authored popular science books in Malayalam and is the recipient of Kerala Sahitya Academi Award for knowledge in literature. In 2015, he received the Lifetime Achievement Research Award of IIT Madras. He supports a school in his village where 500 students are on the rolls.

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. We have been studying the chemistry of nanomaterials with the objective of developing affordable solutions for clean water. 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 Rs. 130/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 1000,000 people. Translation of this science led to the incubation of a company which has its own manufacturing unit now. A healthy mixture of basic science, applications and business in the Indian context is manifested here. Several new technologies are in the pipeline.