INDIAN INSTITUTE OF TECHNOLOGY GANDHINAGAR
RODDAM NARASIMHA DISTINGUISHED LECTURE

Date : April 13, 2015
Timing : 3:30 PM – 5:30 PM
Venue : A-Block Auditorium, IIT Gandhinagar

ARCHITECTURE, PROCESS, AND MATERIALS FOR EFFICIENT INORGANIC-ORGANIC HYBRID SOLAR CELLS

Dr. SANG IL SEOK
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About the Speaker

Prof. Sang Il Seok leads the Global Research Laboratory at Korea Research Institute of Chemical Technology (KRICT) as Research Fellow in the Division of Advanced Materials. He also holds a dual appointment as full professor at Department of Energy Science, Sungkyunkwan University (SKKU), Korea. He obtained his PhD degree in 1995 at Department of Inorganic Materials Engineering at Seoul National University, Korea. From 1996 to 1997, he was a post-doctoral associate in materials engineering at Cornell University, USA. He was also a visiting scholar at University of Surrey, UK, in 2003, and at Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland, in 2006. Dr. Seok's major research focus has been on the integration of mesoporous architecture/semiconductor nanocrystals (including quantum dots)/polymeric hole conductors for high-performance inorganic-organic hybrid photovoltaics such as photodetectors and solar cells, using novel materials. He has published over 125 peer-reviewed papers in world-class journals including Nature Photonics, Journal of American Chemical Society, Angew. Chem. Int. Ed, Nano Letters, etc. and has won several awards for excellence in energy research.

Solar energy harvesting through photovoltaic conversion has gained attention as the most sustainable and environmentally friendly solution for meeting the rapidly increasing **global** energy demand. Of the *many materials and methodologies aimed at producing low-cost, efficient photovoltaic cells* for utilizing solar energy, semiconductor nanocrystals and inorganic-organic hybrid perovskites offer promise of a breakthrough for next-generation solar devices. This is mainly due to the combination of superior optical properties *with suitability for solution-based processing*. Stimulated by ambitions for fabricating stable, high–efficiency, and cost-effective solar cells, Dr. Seok and his group have been **studying** inorganic-organic heterojunction solar cells **by** employing inorganic semiconductor nanoparticles or inorganic-organic hybrid perovskite materials as light absorber and organic hole conductors. In this presentation, Dr. Seok will talk about the use of $Sb_2S(e)_3$ and inorganic-organic hybrid perovskite materials for fabricating efficient solar cells. The surface sulfurization and combination of Sb_2S_3 and Sb_2Se_3 as sensitizer**s has** shown **conversion** efficiency exceeding 8 % under 1 **S**un irradiation with a metal mask. In the perovskite solar cells, process and chemical engineering has enabled **the production** of extremely uniform **and** dense perovskite layers, **with** remarkably improved performance of the cells with a certified power conversion efficiency (PCE) of 20.1% under air-mass 1.5 global (AM 1.5G) illumination of 100 mW cm^{-2} intensity. These results will lead to more efficient and cost-effective inorganic-organic hybrid heterojunction solar cells in the future.