Popular Science Lecture

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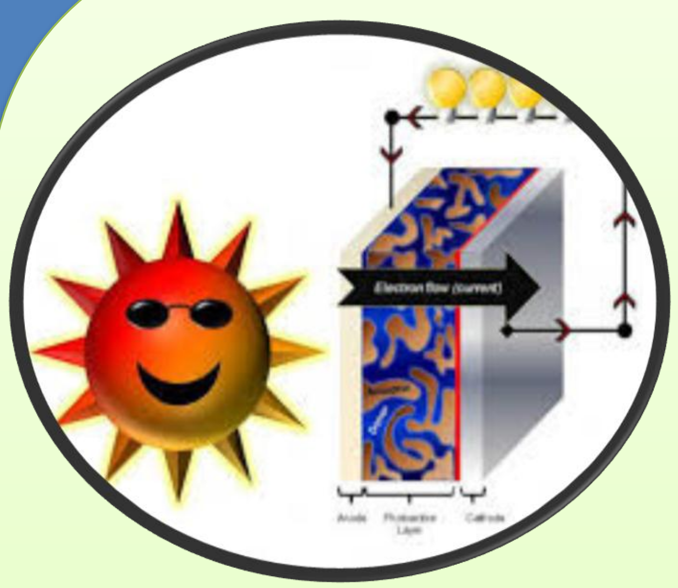

Lecture on

Nanomaterials for Harnessing Solar Energy

by

Dr. Deepa Khushalani

Professor in Materials Chemistry, Dept. of Chemical Sciences,
Tata Institute of Fundamental Research (TIFR), Mumbai 400 005.

Thursday, 26th November, 2020 at 3.00 pm

The session will be held through zoom meeting platform

Registration link : https://forms.gle/MVv2Vax32AzZ9jN17

ALL ARE CORDIALLY INVITED TO ATTEND

Nanomaterials for Harnessing Solar Energy

It is well accepted now that concurrent to the increase in population, India’s rapid economic growth has forced us to recognize the challenge of energy supply as nation’s top priority. Over last two centuries, most of our energy needs have been fulfilled by fossil fuel sources such as coal, natural gas and petroleum. However, the adverse environmental effects arising from carbon dioxide and other pollutants that are released due to fossil fuel combustion necessitates the search for environmentally clean, renewable energy fuel sources. Several alternate sources of energy such as wind, solar, hydro and biomass have been explored over the last several decades. Among all these unconventional energy sources, solar energy has emerged as one of the most practical alternatives to conventional fossil-fuel based sources. This is mainly due to the fact that solar energy reaching the earth from sun is massive, *i.e.* 3 × 1024 J per year or *ca.* 104 times more than what the entire human population currently consumes annually. Hence the potential of this resource is enormous; however, the use of this large energy reservoir still remains a major technological challenge despite the fact that the first solar cells were invented *ca*. 70 years ago. Most of the challenges associated with harnessing this energy effectively involve the total cost of device fabrication, effective cell efficiency that has long term temporal stability and ability to manipulate the cell for various high-end applications. As such, till date harnessing solar energy on a large scale has still not happened and it is still not able to compete fully with the conventional fossil based energy sources.

Keeping the aforementioned issues in mind, the work in the Materials Chemistry Group at TIFR entails the selective processing of inorganic structures with features on the nanometer scale. Formation of such materials has seen a great surge in interest over the last few decades. These materials are known to possess interesting and useful optical, electronic and/or magnetic properties that can subsequently be exploited in a wide variety of applications ranging from novel forms of catalysis to solar energy conversion. The choice of application is contingent on not only the chemical composition of the material but also on the overall morphology, and even more precisely on the accessible surface area. Presented in this seminar will be an overall perspective of the work being performed in our lab where new synthetic routes are being developed to form a variety of functional materials such as large band gap semiconductors that serve as photo catalysts (conversion of solar energy into chemical energy) and also light absorbing structures that form viable photo anodes in third generation photovoltaic devices (solar cells).