Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Internal Seminar

Molecules to Materials

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Photosynthesis is one of the most fundamental and essential process that use solar light to rearrange the bonds of water to oxygen and hydrogen to sustain life on earth. A recent survey shows, it will take only few decades to consume all our energy resources if we go by the present rate of energy consumption on Earth (~13.5 TW in 2001, which is expected to be doubled by 2050 and tripled by 2100). Water splitting is considered as one of the most promising sources of clean and sustainable energy, as it can produce H_2 as well as O_2:

$$2H_2O \rightarrow O_2 + (4H)^+ + 4e^- \quad ; \quad E_0 = 1.23 \text{ V}$$

Of the two half reactions, the hydrogen evolution reaction (HER) is faster than the oxygen evolution reaction (OER) due to the complexity in the process of OER. RuO_2 and IrO_2 are found to be the most effective catalysts in OER process. However, the use of these materials are limited due their high cost and poor availability. Thus, there is an upsurge in interest to develop low-cost catalysts that can effectively oxidize water using minimum energy. As OER proceeds through the involvement of multiple protons and electrons, transition-metal ions with variable oxidation states are found to be effective as oxygen-evolving catalysts (OECs). In this presentation, I will present our recent findings on tetra-nuclear Co(II) phosphate as an effective oxygen-evolving catalyst at pH 13.

Friday, Sep 21st 2018

11:30 AM (Tea/Coffee at 9:30 AM)

Seminar Hall, TIFR-H