Seminar

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Institute for Plasma Research

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Title: Semiconductor Oxides: From Materials to Applications

Speaker: Dr. Amit Kumar Rana
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Date: 23rd September 2022 (Friday)

Time: 03:30 PM

Venue: Join the talk online: https://lobby.ipr.res.in/Dr.AmitKumarRana_PDFTalk

Abstract

Centuries have passed since the scientists are endeavoring to understand the field of inorganic semiconductor physics through rigorous experiments and theoretical approaches. Among the various semiconducting materials, inorganic metal oxides emerge as an essential class of materials which are acknowledged to cover the upcoming materials research. Over the past few decades, rapid and advanced progress have been made in the field of nanostructure based metal oxides.

In this presentation, I will highlight how the nanostructure based metal oxides stands out as a diverse functional material and its flexibility towards morphological tuning and multifunctional applications. The preliminary idea is first to prepare metal oxide nanostructures by different methods followed by a systematic study of its growth mechanism and property alteration with a change in morphology and also to study the effects of doping on the crystal structure, optical and morphological properties. Subsequently, the prepared nanostructures are implemented in diverse applications including gas sensing, magnetic and field emission studies [1-2].

Moreover, related to optoelectronic applications, I will specifically highlight the fabrication of transparent photodetectors by plasma processes. Systematic efforts have been devoted in designing various semiconductor based p-n heterojunction metal oxides which can be directly integrated in the electronic photodetector circuitry [3-4]. In parallel, methodical efforts have been devoted in understanding and realizing pyro-phototronic devices based on metal oxide films [4]. Finally, I will discuss about the other nanostructures (perovskite oxide and 2D transitional metal dichalcogenides) as a platform for efficient water splitting catalysts [5].

References:

[1] A. K. Rana et al. Appl. Surf. Sci. 379, 23 (2016). [2] A. K. Rana et al. ACS Appl. Mater. Interfaces, 9, 7691 (2017). [3] A. K. Rana et al. Nano Energy 64, 103952 (2019). [4] A. K. Rana et al. Adv. Electronic Mater. 5, 1900438 (2019). [5] A. K. Rana et al. ACS Appl. Mater. Interfaces 14, 18248 (2022)