Seminar

Institute for Plasma Research

Title:	Development of low-cost transition metal oxide based Photoelectrodes for efficient Solar Water Splitting
Speaker:	Dr. Praveen Garg UGC-DAE Consortium for Scientific Research, Indore
Date:	14th November 2025 (Friday)
Time:	10.30 AM
Venue:	Seminar Hall, IPR

Abstract

The quest for sustainable and low-cost materials for solar-driven water splitting has motivated my research on transition metal oxide-based photoelectrodes, with a focus on hematite (αFe_2O_3) and nickel oxide (NiO) systems. During my doctoral work at the UGC-DAE Consortium for Scientific Research, Indore, I developed various α-Fe_2O_3 nanostructures, including nanosheets and mesocrystals, using cost-effective methods such as thermal oxidation on Lowcost iron substrate. The role of morphology, orientation, and interfacial chemistry in enhancing charge transport and photocurrent generation was elucidated through detailed optical, electronic and surface analysis employing techniques like FTIR, XPS, Raman and Photoelectrochemical characterizations. Notably, the NiO/α-Fe2O3 heterostructure demonstrate the synergistic effect and, I will demonstrate how the layer ordering is important to achieve the enhanced photoelectrochemical water splitting efficiency. I will also show an induction heating based set up; designed and developed in house for rapid growth of iron oxide nanostructures. Building on this foundation, my postdoctoral research aims to explore advanced semiconductor heterojunctions to unravel charge transfer dynamics and develop efficient, scalable materials for solar energy conversion.