

Seminar

Institute for Plasma Research

Title : Two dimensional (2d) transition metal dichalcogenides (TMDC) material for the electronic applications
Speaker: Dr. Rohit Sharma
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Date : 6th October 2023 (Friday)
Time : 03.30 PM
Venue: Seminar Hall, IPR

Abstract: With the discovery of graphene, a new avenue for the study of two-dimensional (2D) materials was opened. Device design can now take on a new dimension thanks to the atomically thin 2D materials, which may help to solve the problems that arise when intricate components are included into electrical systems. Material quality and a defect-free synthesis processes have a major impact on device performance. Over the past decades, there has been a considerable advancement in the synthesis of transition metal dichalcogenides (TMDCs) that are atomically thick. To develop few layer thick nanosheets of various semiconducting TMDCs (e.g., MoS₂, WS₂, MoSe₂, and WSe₂) and study their structural and optical properties using various characterization techniques, it is still necessary to focus on optimization and large-scale growth of 2D-TMDCs. Keeping these in mind, we have work on the synthesis of 2D-TMDC material synthesis and their properties. The MoS₂ have been exfoliated in various solvents and its structural and optical properties have been studied. The photo-electrical study reveal that the MoS₂ based photodetector have negative photo-conductivity with self-powered behaviour. Further, the exfoliated TMDC (MoS₂, WS₂, MoSe₂, and WSe₂) have been studied as the channel material in pre-patterned FET devices. WS₂ based FET device has maximum threshold voltage -0.47V. This could pave the way for FET fabrication for those who doesn't have the sophisticated semiconductor fabrication facilities.

Keywords: Two-dimensional materials, liquid phase exfoliation, structural and electrical properties.