National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Assessment of Crystallographic and Mechanical Properties of Single-Crystal Pure Tungsten
Speaker	: Gautam Ranjan (Roll No. 522me1002)
Supervisor	: Prof. Saurav Datta (2524), PIC Departmental Seminar
Venue	: ME Seminar Hall (ME-001)
Date and Time	: 05 Aug 2025 (10:00 AM)
Abstract	: The present study is based on the experimental analysis of the material properties of pure single-crystal tungsten, identified for its exceptional mechanical strength, high-temperature resistance, excellent electrical and thermal conductivity, and low thermal expansion. Various techniques were employed to characterize the tungsten sample, including powder X-ray diffraction (XRD), Laue diffraction, scanning electron microscopy (SEM), and the Vickers hardness test. The specimen used in the study has a 20 mm diameter and 1 mm in thickness. Powder XRD analysis was performed using a Malvern PANalytical diffractometer with a scanning rate of 10°/min, a step width of 0.02°, and a Bragg angle (2θ) range from 20° to 100°. To analyse the orientation and crystal quality of the pure single-crystal tungsten, Laue diffraction was conducted using a Huber system operating at 40 kV and 30 mA. SEM was used to examine the surface morphology of the material, with magnifications ranging from 50 μm to 500 μm. The Vickers hardness test was carried out to estimate the Young's modulus of the tungsten, which was found to be in the range of 600–650 GPa. In the powder XRD analysis, the most intense diffraction peak was observed at 40.35°, followed by a secondary peak at 87.22°. The combined use of these techniques confirmed that the tungsten sample had a high purity level of 99.992% and exhibited a well-defined single-crystal structure. Keywords: Single crystal tungsten, Laue diffraction, Young’s modulus, Surface morphology, Bragg angle