DEFECTS IN CRYSTALLINE SOLIDS (PART-II)

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INTENDED AUDIENCE: Undergraduate Students and first year graduate students of following discipline: Materials Engineering, Mechanical Engineering, Metallurgical Engineering, Industrial Engineering, Electrical Engineering.

PREREQUISITES: Under graduate level mathematics, thermodynamicsl

INDUSTRY SUPPORT: Manufacturing Companies, Iron and Steel companies, Automobile companies, Equipment manufacturers,

COURSE OUTLINE : This is a continuation of the course “Defects in Crystalline Solids (Part-I). In this part of the course, students should be able to Understand dislocations with respect to particular crystal system (eg. FCC, BCC, HCP and also superlattices)Relate dislocation to the plastic properties of the material, particularly, strengthening mechanisms

ABOUT INSTRUCTOR:

Prof. Shashank Shekhar is an Associate professor at IIT Kanpur. He joined IITK in 2010 and has since taught manufacturing related courses to 2nd year, 3rd year as well as 4th year UG students. His research interest lies in thermomechanical processing, particularly severe plastic deformation using techniques like machining and constrained groove pressing.

COURSE PLAN :

Week 1: Dislocations in FCC; Partial Dislocations; Thompson’s Tetrahedron; Cottrell Lock; Lomer-Cottrell Lock; Intersection of extended dislocations
Week 2: Dislocations in BCC, HCP and other systems; Dislocations in Superlattices; Kear-Wilsdorf Locks
Week 3: Interaction of dislocations with vacancies and its effect on plasticity; Strengthening mechanisms due to interaction of dislocations with interfaces, precipitates, inclusions; Dislocation generation mechanisms
Week 4: Dislocations and Grain boundaries; Read-Shockley model for Low angle grain boundaries; A modified model for LAGB energy; Energy of LAGBs from dislocation model; CSL boundaries and secondary dislocations; Geometrically necessary dislocations (GNDs) and Statistically Stored Dislocations (SSDs).