Announcement

Crystal Defects: Physical Effects and Mechanics
apl. Prof. Dr. Jeong-Ha You

Learning outcomes
The students who have successfully completed the course work of this lecture will
• gain basic understanding on the types, structures, formation mechanisms and physical effects of various kinds of crystal defects,
• be equipped with theoretical skills for describing the dynamic interactions and energetic reactions between defects based on a continuum mechanics framework,
• be able to interpret various physical, thermal and mechanical features being observed in actual crystalline solids in terms of defect effects in addition to idealized bulk behaviours,
• get fundamental knowledge on the microstructures and mechanical behaviours of engineering materials.

Content
• Classification and structures of crystal defects
• Point defects: formation mechanisms, physical effects, thermodynamics, irradiation damage
• Elements of solid mechanics (linear elastic), continuum slip theory, crystal plasticity
• Line defects: edge/screw dislocation, slip mechanisms, stress/displacement/strain fields
• Dynamics of dislocations: line tension, forces between dislocations, reaction mechanisms
• Planar defects: structure of grain boundaries, impact on mechanical behaviour, interactions
• Recovery of defects, recrystallization and grain growth

Prerequisites
Introductory courses on calculus, mechanics and solid state physics (or materials science)

Additional information
Course type: Block lecture
Without examination: 2 ECTS credits
With examination (individual project): 3 ECTS credits

Date
Monday, 7.3. - Friday, 11.3.2016, 12:30 – 18:00
Room: 027/2203

Lecturer
apl. Prof. Dr. Jeong-Ha You, Max Planck Institute of Plasma Physics, Garching (you@ipp.mpg.de)

Literature
• Mechanical Behavior of Materials, Keith Bowman, John Wiley & Sons, 2004
• Physikalische Grundlagen der Materialkunde, G. Gottstein, Springer-Lehrbuch (3 Aufl.), Springer
• Introduction to Dislocations, Hull & Bacon, Pergamon (3rd Ed.)
• Deformation and Fracture Mechanics of Engineering Materials, R. Hertzberg, John Wiley & Sons
• Theory of Dislocations, Hirth & Lothe, John Wiley & Sons
• Crystal Defects and Microstructures, R. Phillips, Cambridge University Press
• Crystallography and Crystal Defects (revised ed.), A. Kelly, G. W.Groves, P. Kidd, John Wiley & Sons
• Mechanical Metallurgy, M. Meyers, K. Chawla, Prentice Hall