

MPHE-025: MATERIALS SCIENCE

List of OERs

Part-3: Imperfections in Solids

In the second part of the course you learnt about the material processing. In this third part we are providing a topic-wise list of lectures pertaining to imperfections or defects in the solid materials.

We are prescribing **six** lectures in this part which are marked by serial numbers **26 to 31**. Since these lectures are part of different course prepared by the expert with a different sequence, the Lecture number mentioned against each lecture may not match with our serial number.

Through these six lectures, you will learn about different types of defects observed in the solid materials, their causes and also effects of these defects on the properties of the materials.

EXPECTED LEARNING OUTCOMES:

After going through these lectures you should be able to:

- classify the defects based on dimensionality;
- explain the symmetry associated with the defects;
- state the origin of point defects;
- explain the various types of deformations observed in crystalline solids;
- discuss various types of dislocations;
- describe the interactions of dislocation with point defect and free surface of the crystal;
- explain the different types of grain boundaries; and
- describe the effects of defects on the properties of the materials.

These seven lectures are delivered by:

Prof. Anandh Subramaniam

Department of Materials and Metallurgical Engineering IIT-Kanpur

Course: Structure of Materials

Archive Link: <https://archive.nptel.ac.in/courses/113/104/113104014/>

Apart from the lectures prescribed below, this archive also contains other lectures describing detailed mathematical treatment of dislocations observed in the crystalline solids. If you are interested in deeper study of the topic, you may watch Lectures 25 and 26 given in the archive.

26. Lecture-22: Subramaniam: Classification of defects; interaction of defects.
Youtube Link: https://www.youtube.com/watch?v=F_3h7t1AM4
27. Lecture-23: Subramaniam: Types of point defects and their origin
Youtube Link: <https://www.youtube.com/watch?v=BW2YaJE6U7M>
28. Lecture-24: Subramaniam: Dislocations in solids; deformations caused in crystal structure
Youtube Link: <https://www.youtube.com/watch?v=JH9x87yjoEk>
29. Lecture-27: Subramaniam: Dislocation-point defect interactions; yield point phenomenon; dislocation-precipitate interaction; dislocation-free surface interaction
Youtube Link: <https://www.youtube.com/watch?v=TqVhCe9xVPk>
30. Lecture-28: Subramaniam: 2-D defects in crystals; calculation of surface energy; crystal surface defects
Youtube Link: <https://www.youtube.com/watch?v=ic2okJ3ySJs>
31. Lecture-29: Subramaniam: Interfaces and grain boundaries in crystal
Youtube Link: <https://www.youtube.com/watch?v=oDRs3wAU6hQ>

After completing the study of defects in solid, you can now proceed to the fourth part of the course dealing with Diffusion and Phase Transformations in Solids.