

Structure of solids

Introducing

Description

Crystal structure

Part 1. Geometric crystallography

Part 2. Symmetries in crystals

Part 3. X-ray crystallography

Part 1. Description of crystalline solids:

- The perfect crystal: definition and description of typical ionic and covalent structures.
- Point lattice : unit cell, Miller indices, lattice planes, interplanar spacing ;
- Crystallographic asymmetric unit;
- Reciprocal lattice: definition and properties

Part 2. Crystal symmetry

- Definitions of symmetry elements, notions of group theory, crystal systems;
- Stereographic projection and point group representations;
- Description of translational symmetry elements, space groups and representations.

Part 3. X-ray crystallography

- X-ray scattering and absorption by atoms ;
 - X-ray diffraction: diffraction conditions (Laue conditions, Bragg relation, Ewald sphere), calculation of diffracted intensities (structure factor);
 - Main structural characterization methods for crystals, powders and thin films
 - Implementation and analysis of powder diffractograms and thin film diffractograms
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Objectives

At the end of this module, the student should have understood and be able to explain (main concepts):

- the structure and symmetry of crystalline solids
- X-ray diffraction by crystalline solids

The student should be able to :

- characterize the structure of a crystal, classify crystalline solids by their symmetry, orient a crystal, apply basic X-ray diffraction techniques and analyze the results of a radiocrystallography experiment.
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Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse