Summary
Students learn about response of electrically insulating materials to electrical and mechanical fields. The emphasis is on effect of various types of defects on properties, on crystal structure/microstructure - property relations, and on ways how to engineer properties of materials for applications.

Content

Keywords
dielectrics; ceramics; single crystals; electrical conductivity; dielectric relaxation; piezoelectricity; ferroelectricity, capacitors; thermistors; actuators; sensors; resonators; composites; multiferroics;

Learning Prerequisites
Required courses
- General physics;
- General inorganic chemistry;
- Mathematical analysis;
- Introduction to materials;
- Thermodynamics;

Recommended courses
- Chrystallography and diffraction methods;
- Theory of materials: from structure to properties I

Important concepts to start the course
- atomic and electronic structure of materials; chemical bonds; phase transitions; symmetry and materials;

Learning Outcomes
By the end of the course, the student must be able to:

• Interpret given experimental behavior of materials in terms of physical processes learned during the course
• Hypothesize how crystal structure, defects structure, microstructure, chemical composition affect properties of materials.
• Argue on advantages and disadvantages of given materials for various applications

Transversal skills

• Take feedback (critique) and respond in an appropriate manner.
• Access and evaluate appropriate sources of information.
• Continue to work through difficulties or initial failure to find optimal solutions.

Teaching methods

lectures; discussions;

Expected student activities

attendance of lectures; reading distributed written material; participating in discussions in class;

Assessment methods

Written exam

Supervision

Office hours Yes
Assistants No

Resources

Bibliography
Moulson, "Electroceramics", Chapman&Hall 1990

Ressources en bibliothèque

• Electroceramics / Moulson
• Properties of materials : anisotropy, symmetry, structure / Newnham

Notes/Handbook

Copies of viewgraphs; Written text based on lectures (partial coverage);