Summary

Most materials e.g. ceramics, metals, polymers or concrete pass during their processing one or more steps in powders. This course discusses and presents the science & technology of important powder processing steps like compaction, dispersion, sintering and novel densification technologies.

Content

• Theoretical and empirical models for powder packing and compaction including discrete element modelling (DEM) (examples for ceramics and metals)

• Particle-particle interactions (colloidal chemistry, DLVO theory, non-DLVO forces, polymer adsorption, colloidal stability assessment). Examples from cement and concrete, landslides, ceramic powder granulation, paper coating.

• Introduction to atomistic modelling - with examples from grain boundary segregation of dopants in ceramics, polymer adsorption and crystal growth
• Sintering mechanisms (metal, ceramics, influence of the microstructure, simulation)

• Novel technologies (includes rapid prototyping)

• The support material for the course are copies of the slides used to present the course along with a few key text books and review articles - which the students are encouraged to use to supplement the documents provided.

Keywords

powder technology, sintering, compaction, modelling, cement, ceramics, metals, colloidal dispersion

Learning Prerequisites

Recommended courses
Ceramics, Ceramic processing, material science

Important concepts to start the course
microstructure property relationships

Learning Outcomes
By the end of the course, the student must be able to:
- Assess / Evaluate the use of different modelling methods in powder technology
- Model the stability of a colloidal dispersion
- Describe the different sintering methods used in powder technology
- Explain the limitations of classical DLVO theory
- Give an example in detail of the importance of powder characteristics in an everyday example of the application of powder technology
- Discuss powder compaction in detail

Teaching methods
- Lectures

Assessment methods
- Oral exam

Supervision
- Office hours: No
- Assistants: No
- Forum: No

Resources
- Ressources en bibliothèque
  - Powder Metallurgy Science / German

Notes/Handbook
- see http://ltp.epfl.ch/page-35623-en.html chapter "Powder technology"

Websites