

MSE-462

Powder technology

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Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

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

- <http://ltp.epfl.ch/page-35623-en.html>