MSE-304 **Surfaces and interfaces**

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Cursus	Sem.	Type
Materials Science and Engineering	BA5	Obl.

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

Summary

This lecture introduces the basic concepts used to describe the atomic or molecular structure of surfaces and interfaces and the underlying thermodynamic concepts. The influence of interfaces on the properties of materials is also discussed.

Content

- Crystallographic representation of surfaces, reconstruction
- Epitaxial growth
- Surface energy
- Solid-liquid interfaces, interfacial energy, work of adhesion
- Solid-solid interfaces, grain boundaries, interfacial energy
- Surface energy, surface states and catalysis
- Electronic properties of surfaces, work function, surface dipoles
- Surface states
- Effect of surfaces in bulk materials properties.

Learning Outcomes

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

- Analyze a surface reconstruction
- Anticipate the stability of a given interface
- Decide what are the necessary thermodynamics concept to describe an interface
- Anticipate the behaviour of molecules close to the interface
- Infer certain processes at the interface

Teaching methods

Ex cathedra (flipped classroom) and exercises

Assessment methods

The course is evaluated by an oral final exam during the exam session.

Resources

Bibliography

James M. Howe, **Interfaces in Materials,** Wiley

Ressources en bibliothèque

- Interfaces in Materials / Howe

Notes/Handbook

Detailed lecture slides and interactive Mathematica notebooks will be made available during the course.

Moodle Link

- https://go.epfl.ch/MSE-304