MSE-627

X-Ray Analysis for thin films

Dommann Alex, Maeder Xavier

Cursus	Sem.	Type
Materials Science and Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Written
Workload	60h
Hours	**34**
Courses	22
Exercises	12
Number of positions	**15**

Frequency

Every year

Remark

October 12 - 15, 2026 To benefit from this course, EPFL Doctoral School has agreed to fund it. If you register, please ensure that you can attend to avoid last-minute and mid-course withdrawals

Summary

Intro into the relation between physical and structural properties; introduction into different X-Ray techniques; examples of successful technological transfer using X-Ray techniques; Structural properties; coherent and non coherent scattering; high resolution X-Ray techniques; stress; coatings.

Content

This course uses X-ray Diffraction (XRD) techniques to investigate the structural properties of coatings obtained by different deposition methods. Understanding the structure of thin films will improve their fabrication. After introducing basic thin film theory and thin film XRD characterisation methods, fundamental theory and limitations will be discussed including examples of films in applications and how their structures influence characteristics.
The structural properties of the coatings obtained at different substrate temperatures for different chemical compositions will be discussed by X-Ray Diffraction (XRD) techniques. The composition of the layers could also be studied by RBS. The complementarily will be discussed. The understanding of the structure will result in an improved thin film production and fabrication.
Today, coatings are used in many applications for functional or / and decorative purposes. In functional coatings, the surface properties of the substrates such as adhesion, corrosion or wear resistance can be changed. In semiconductor device fabrication, the coating adds completely new properties such as electrical conductivity, magnetic or optical responds.

- Introduction to some basic methods used for thin film characterisation characterisation. Introduction into the HR-XRD
- Discussion of the fundamental theory behind the methods and their limitations
- Examples of thin films in applications and the influence
- Presentation of models for interpreting stress/strain and defect concentration

Assessment methods

Written exam