UNIVERSITY of MISKOLC
Faculty of Materials Science and Engineering

Antal Kerpely Doctoral School of Materials Science & Technology

Anisotropy examinations

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COURSE DESCRIPTION

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Anisotropy examinations

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Lecturer

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Recommendation

The lecture is propoesd for all students of the Kerpely doctral school, especially in the field of metalforming, physical metallurgy, heat treatment and casting.

Language

Hungarian or English.

Scope

The objective of the course is to teach the methods and equipments for crystallographic anisotropy examinations (X-ray diffraction texture measurements, EBSD, TEM orientation mapping), to help understand the main application options.

Methodology

The course is held in contact lectures. The time of contact courses is based on agreements with the students.

Topics

1.Topic

X-ray diffraction texture measurements

The phenomenon of crystallographic texture
Measuring pole figures, defocusing correction, inverse pole figures
Recalculating pole figures, ODF synthesis
Measuring pole figures with centreless X-ray diffractometers in Ω, modified ψ, ψ modes

Basic questions:

1. *What is the effect of texture on the interference function?*
2. *What type of sample preparation is required for pole figure measurements; which methods disturb pole figure measurements?*
3. *Expound the X-ray diffraction-based pole figure measurements.*
4. *What is "dead space"*
5. *Why is defocusing correction required, how is it carried out?*
6. *What typical pole figures are commonly known?*
7. *What is the representation system of typical rolling and fiber texture?*
8. *Expound the depth texture measurement method of rolled sheets.*
9. *Expound the method of inverse pole figure measurements, their interpretation.*
10. *What is the Euler-space?*
11. *Expound the method of ODF synthesis, its interpretation.*

12. *What are the texture-components?*
13. *Compare the information content of pole figures and the ODF.*
14. *Expound the texture measurement method with centreless X-ray diffractometer in Ω mode.*
15. *Expound the texture measurement method with centreless X-ray diffractometer in ψ mode.*

2.Topic
Electron backscattered Diffraction
Diffraction cones, Kikuchi-lines
Orientation map, standard projection, pole figures
Phase map
Basic questions:

1. *What type of sample preparation is required for EBSD examinations?*
2. *How are Kikuchi-lines produced?*
3. *Expound the method of EBSD orientation mapping.*
4. *Expound the method of EBSD phase mapping.*
5. *Expound the method of EBSD pole figure measurement.*

3.Topic
Transmission Electron Microscope orientation examinations
Electrondiffraction, reciprocal lattice
Orientation map
Phase map
Misorientation

Basic questions:

1. *What type of sample preparation is required for TEM orientation examinations?*
2. *Expound the diffraction mode of TEM.*
3. *Expound the method of TEM orientation mapping.*
4. *Expound the method of TEM phase mapping.*
5. *what is the quality index?*
6. *How are TEM pole figures made?*
7. *What is the method of misorientation measurement?*

References

1. Olaf Engler, Valerie Randle: Introduction to Texture Analysis, CRC Press, 2010
2. U. F. Kocks, C. N. Tomé, H.-R. Wenk, Texture and Anisotropy, Cambridge Univ. Press, 2005
3. Satyam Suwas, Ranjit Kumar Ray, Crystallographic Texture of Materials, Springer, 2014
4. Dr Bárczy Pál, Dr Fuchs Erik, Metallográfia I. Tankönyvkiadó, 1981
5. Hegman Norbert, Kristály Ferenc, Pekker Péter, Váczi tamás, Nanometrológia, Miskolci Egyetem, 2011

Exam

Oral exam if basic questions are answered correctly.

Complex exam questions

1. Interpretation of crystallographic texture, its effect on material properties, on interference function, representation of rolling and fiber textures.
2. Interpretation of X-ray diffraction-based pole figure measurements. Defocusing correction, information content of pole figures, deficiencies and limits of pole figures.
3. Interpretation of ODF, its information content, texture components.
4. Interpretation of EBSD examinations. Orientation mapping, phase mapping, pole figure production, phenomenon of quality index.
5. Interpretation of TEM orientation examinations. Orientation mapping, phase mapping, misorientation measurements.