CRYSTALLOGRAPHIC TEXTURE ANALYSIS AIDED BY LABOTEX – THE TEXTURE ANALYSIS SOFTWARE

1-Day training

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This course is intended for users of X-ray and neutron diffraction systems, EBSD systems and other interested parties who want to deepen their knowledge about possibilities of texture analysis aided by the software. It is designed for beginners who want to get started with the LaboTex program and experienced users who want to draw maximum benefit from the latest version of LaboTex software. The course contents includes fundamentals of texture analysis, data and results management, texture qualitative and quantitative analysis, experimental data processing (pole figures data, EBSD data), texture modeling, ODF calculation, complete pole figures recalculation from ODF, inverse pole figures calculation from ODF, and some anisotropy factors. In the practical part of the workshop the course participants will perform several exercises of texture analysis in relation to exemplary selected real materials.

Outline

1. Fundamentals of 3-D Texture Analysis.
   - 1.1. Orientation.
   - 1.2. Orientation Distribution Function (ODF), Pole Figure (PF), Inverse Pole Figure (IPF).
   - 1.3. ODF calculation (types of algorithms for ODF calculation, ADC /Arbitrarily Defined Cells/ method, ghost correction).
2. Symmetry aspects of 3-D texture analysis.
   - 2.1. Crystal symmetry (CS) and sample symmetry (SS).
   - 2.2. Space groups and symmetry elements for space groups.
   - 2.3. Basic regions of ODF space in correlation to CS and SS.
3. Data sources and their formats for LaboTex :
   - 3.1 Experimental data (X-Ray, neutrons, EBSD)
   - 3.2 Model data
4. Pole figures processing in LaboTex.
   - 4.1. Pole figures types in LaboTex.
   - 4.2. Defocusing, background and phase corrections of pole figure data.
   - 4.3. Preparation of pole figures to ODF calculations (symmetrization, rotation, pole figures cutting of regions).
   - 4.4. ODF calculation options.
   - 4.5. ODF symmetrization.
   - 4.6. Interpretation of RP convergence factor.
   - 4.7. Texture index.
   - 4.8. Calculation of pole figures and inverse pole figures from ODF.
5. Qualitative texture analysis.
   - 5.1. Texture orientations and texture components. Symmetrically equivalent positions in pole figures and ODF space.
   - 5.2. LaboTex orientations data base. Edition of orientation database. Automation of orientation analysis.
   - 5.3. Qualitative texture analysis on pole figures.
   - 5.4. Qualitative texture analysis on ODF.
   - 5.5. Reports from qualitative texture analysis.
6. Quantitative texture analysis.
   - 6.1. Volume fraction of texture components – integration method.
   - 6.2. Volume fraction of texture components – model function method.
   - 6.3. Reports from quantitative texture analysis.
7. Analysis of inverse pole figures.
8. Texture modeling.
9. Fiber analysis (ODF sections, skeleton lines, fibers database).

10. Texture analysis on the basis of EBSD data or model data.
11. Calculation of anisotropy factors (Kearn's factors)
12. Sample reference system changes of ODF transformations.
13. Individual orientations set calculation from ODF.
14. Graphical possibilities in LaboTex (2D, 3D visualization).

Practical training

Course participants should bring their own PC-laptop (Windows 2000, XP, 2003, Vista)

1. LaboTex installation.
2. Basic information about LaboTex software
    - 2.1. Data and results management (users, projects, samples, jobs).
    - 2.2. LaboTex basic options.
    - 2.3. Adjustment of pole figures registration convention to LaboTex convention.
    - 2.4. High quality images options.
    - 2.5. LaboTex reports development.
3. Texture analysis of aluminum.
    - 3.1. Defocusing correction using texture standard samples.
    - 3.2. Symmetrization options (monoclinic, orthorhombic, axial).
    - 3.3. ODF calculation, texture index, RP factor, recalculated pole figures.
    - 3.4. Qualitative ODF analysis (texture components recognition).
    - 3.5. Quantitative ODF analysis (model function method).
    - 3.6. Development of texture models.
4. Texture analysis of ferritic stainless steel.
    - 4.1. Defocusing correction using the file with correction coefficients.
    - 4.2. Fibers analysis.
    - 4.3. Creations of ODF sections.
    - 4.4. Creations of skeleton lines (skeleton lines options).
5. Texture analysis of copper deposit (orthorhombic and axial sample symmetry).
    - 5.1. Qualitative ODF analysis (texture components identification).
    - 5.2. Quantitative ODF analysis (model function method).
    - 5.3. Quantitative ODF analysis (integral method).
    - 5.4. Inverse pole figures analysis.
6. Texture analysis of thin layers with fiber texture.
    - 6.1. Defocusing correction in thin layer from Schulz formula.
    - 6.2. Finding of fiber direction.
    - 6.3. ODF transformation (change of sample reference system).
7. EBSD data processing in LaboTex.
    - 7.1. ODF calculation from sets of individual orientations.
    - 7.2. Pole figures and inverse pole figures calculations.
    - 7.3. Qualitative and quantitative texture analysis.
8. Texture calculations and analysis in low crystal symmetry materials (Zr,Ti, wood-cellulose, polypropylene and other polymers, etc.).