

Special sections of inorganic chemistry

The course focuses on the analysis methods of synthetic or mineral nanomaterials. Choice of an appropriate analytical method has crucial importance in revealing the correlations between structure, composition, and properties of the materials. General trend on *in-situ* and combined analytical techniques will be also discussed.

Course plan:

1. Introduction: analytical methods in inorganic and solid-state chemistry
2. Scanning electron microscope for morphology, structure, and element composition analysis
3. Transmission electron microscope for morphology, structure, and element composition analysis
4. Thermal analysis methods
5. Powder X-ray diffraction for nanomaterials study
6. Methods of porous structure study
7. Infrared and Raman spectroscopies
8. Special case of crystal growth: spontaneous scrolling and strain-related size limitations

Literature:

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- [2] P. Elchin, *Handbook of Sample Preparation for Scanning Electron Microscopy and X-Ray Microanalysis*, Springer US, **2009**.
- [3] A. J. Schwartz, M. Kumar, B. L. Adams, Eds. , *Electron Backscatter Diffraction in Materials Science*, Kluwer Academic / Plenum Publishers, New York, **2000**.
- [4] L. D. Hanke, Ed. , *Handbook of Analytical Methods for Materials*, Materials Evaluation And Engineering, Inc., Plymouth, **2001**.
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- [6] D. Shindo, T. Oikawa, *Analytical Electron Microscopy for Materials Science*, Springer Japan, Tokyo, **2002**.
- [7] P. K. Gallagher, Ed. , *Handbook of Thermal Analysis and Calorimetry*, Elsevier Science B.V., Amsterdam, **1998**.
- [8] P. J. Haines, Ed. , *Principles of Thermal Analysis and Calorimetry*, RSC, Padstow, **2002**.
- [9] S. Lowell, J. E. Shields, M. A. Thomas, M. Thommes, *Characterization of Porous Solids and Powders: Surface Area, Pore Size and Density*, Springer Netherlands, Dordrecht, **2004**.
- [10] S. Wartewig, *IR and Raman Spectroscopy: Fundamental Processing*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, **2003**.
- [11] W. D. J. Callister, D. G. Rethwisch, *Materials Science and Engineering: An Introduction*, Wiley, **2010**.