EUROMAT 2017/ Symposia Structure/Area D

D.2

Title:
Nanoscale Materials Characterization and Modeling by Advanced Microscopy Methods

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Summary

This symposium covers the nanoscale characterization of the structure and chemical composition of materials, as well as structure-property relationships attained through advanced electron and scanning probe microscopies and associated spectroscopies. Furthermore, it includes the atomistic and energetical modelling of nanostructures performed in synergy with such experimental methods. We invite contributions spanning the development of microscopy or modelling in materials science, and applications comprising investigations of both established and innovative materials, nanomaterials, heterostructures, nanostructures, interfaces, and defects.

Keynote and Highlight speakers:

Prof. **Gustaaf Van Tendeloo** (EMAT, Antwerp Univ., Belgium)
Prof. **Sokrates Pantelides** (Vanderbilt Univ., USA)
Prof. **Eva Olsson** (Chalmers Univ., Sweden)
Dr. **Martin Albrecht** (Leibniz Inst. for Cryst. Growth, Germany)
Prof. **Wayne Kaplan** (Technion Inst. of Technology, Israel)

Scope:

Advances in electron and scanning probe microscopies are facilitating the determination of materials structures and structure-property relationships down to the sub-nanometer scale in synergy with image and spectra simulations based on minimum energy models of the investigated systems. Electron microscopy is a prominent tool for the direct structural and compositional characterization of materials at the nano and atomic scales. State-of-the-art TEM covers a range of techniques including HRTEM, STEM, CBED, 3D electron tomography and electron holography, as well as spectroscopies such as EELS, EFTEM and EDXS. At the forefront is the effort for accurate quantitative chemical and strain analysis of nanostructures employing image simulations and exact measurement methods such as peak finding and geometric phase analysis. At the same time, atom probe tomography is a distinct approach that is rapidly developing to provide nanoscale compositional analysis. In a synergistic approach, these experimental methods are combined nowadays with atomistic simulations and energetical calculations using approaches such as ab initio, molecular dynamics, Monte Carlo or finite elements, spanning length and time scales, in order to advance models and to better understand materials behavior. This symposium invites contributions focusing on the aforementioned methods and on their application to the investigation of nanomaterials, low dimensional materials (e.g. quantum dots, nanoparticles, nanowires, 2D materials), semiconductors, energy-related materials, functional and smart materials, thin films, metals, alloys, biomaterials, amorphous and soft materials.

Topics to be covered by the symposium:

- ✓ Imaging and diffraction including aberration correction, CBED and precession diffraction
- ✓ Electron holography
- ✓ Spectroscopies including EDXS, EELS, EFTEM
- ✓ Electron and atom probe tomographies
- ✓ In situ characterization by TEM and scanning probe methods and spectroscopies
- ✓ Novel quantification methods and image simulations for the determination of composition and strain
- ✓ Special methods for sample preparation of nano objects for quantitative analysis including FIB and ultramicrotomy
- ✓ Atomistic simulations and energetical calculations of materials structures and structure-property relations
- ✓ Applications to low dimensional materials systems
- ✓ Applications to heterostructures, nanostructures, interfaces and defects
- ✓ Applications to metallic and ceramic materials

Papers will be published in:
(a) Philosophical Magazine, (b) Materials Science & Technology (Taylor & Francis)

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