SINNCE

COURSES ON ADVANCED TOPICS III

EELS AND CL FOR CHEMICAL AND OPTICAL QUANTIFICATION IN (SCANNING) TRANSMISSION ELECTRON MICROSCOPY

FSI, Technická 2, A5/U7

5–6/6/2019

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Wednesday 5/6/2019

10:00 – 12:00 **INTRODUCTION AND ELASTIC ELECTRON SCATTERING**
An historic overview about the development about electron beam techniques for chemical analysis is given. The three main analytical techniques in (S)TEM are discussed in general, their fields of application are outlined. Elastic scattering cross sections are calculated and discussed.

13:30 – 15:00 **INELASTIC ELECTRON SCATTERING I**
An introduction into Bethe theory is briefly given as preparation step for the dielectric formalism based on Maxwell's theory. The Drude and the Drude-Lorentz model are discussed as well as plasmonic excitations in solids and nano-objects.

13:00 – 14:00 **INELASTIC ELECTRON SCATTERING II**
Kramers-Kronig Analysis and the retrieval of the optical properties are contoured within this lecture. Additionally, radiation losses are investigated and multiple scattering is described. Finally, yet importantly, the ionization edge fine structure (ELNES) is discussed.

Thursday 6/6/2019

09:00 – 10:30 **IRESOLUTION LIMITS, SPATIAL RESOLUTION, AND SPECTROMETER DESIGNS**
The spatial resolution and the resolution limits of inelastic electron scattering techniques are outlined by making use of the Rose-criterion. Finally, several spectrometer designs are discussed in terms of advantages and disadvantages.

11:00 – 12:30 **ENERGY FILTERED TEM AND CHEMICAL MICROANALYSIS IN EELS**
Energy Filtered TEM (EFTEM) is a widely used technique for fast elemental mapping. Its advantages and disadvantages are discussed, before chemical microanalysis is described. At the end, chemical micro analysis by terms of EFTEM is introduced.

14:00 – 15:30 **CATHODOLUMINESCENCE**
Cathodoluminescence becomes more and more common, even in a STEM. We discuss the applications and limitations for semiconductors and nano-objects.

The SINNCE project has received funding under the Horizon 2020 Research and Innovation Programme (GA 810626)

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