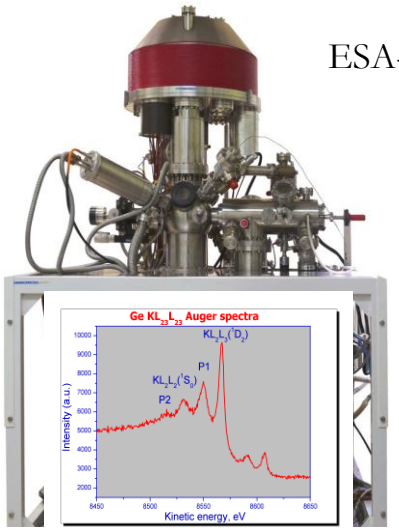
Reflection Electron Energy Loss Spectroscopy (REELS) for surface study

Preface

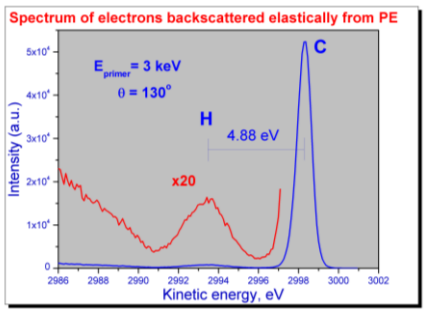
In Reflection Electron Energy Loss Spectroscopy (REELS) the surface of a specimen is bombarded with a low energy (<10 keV) electron beam. As a results of excitation of the near surface region the electrons are scattered both elastically and inelastically, providing information on the structure of compounds at the surface. The scattered electrons are analysed by an electron spectrometer to get the energy distribution of the reflected electrons.

Infrastructure



ESA-31 equipment

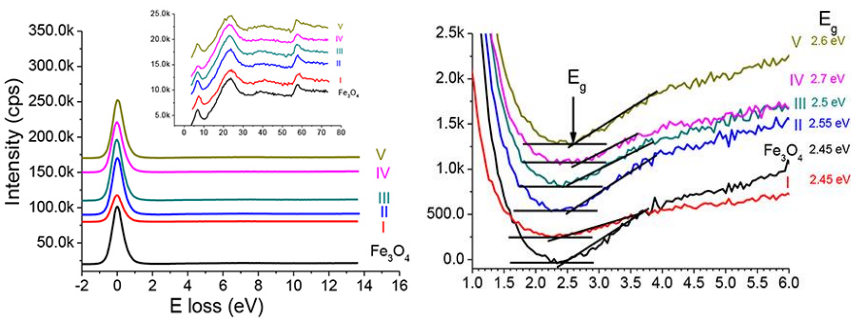
- Auger-electrons (AES, XAES)
- X-ray photoelectrons (XPS)
- Elastically (EPES) and inelastically (REELS) scattered electrons
- $\Delta E/E: 10^{-3} \div 10^{-5}$; E=20 eV - 10 keV



- Study of solid-state and chemical effects on KLL Auger spectra: experiments and models of interpretation.
- Calculations of energy loss in XPS. Decoupling of intrinsic, extrinsic and surface excitations of photoelectrons during their transport within the bulk solid.

Example

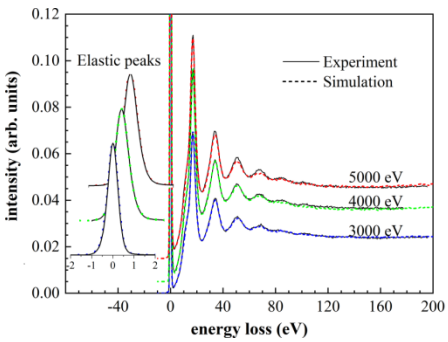
Study of Fe_3O_4 nanoparticles (MNPs) functionalized with biocompatible adsorbed molecules



Comparison of elastic peak and spectrum of inelastic losses of electrons on valence band electrons (left) and evaluation of band gap energy values (right) from REELS spectra recorded from Fe_3O_4 MNPs

[B. Lesiak et al., Front Chem 7:642 (2019) p. 16]

Study of optical properties of Si and Ge determined by high-precision analysis of REELS spectra



The final simulated REELS spectra in comparison with experimental results

[L.H. Yang, K. Tőkési et al., Phys Rev B 100 (2019) 245209]

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