IAP Seminar

Olga Ridzel

TU Wien, Institut für Angewandte Physik

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TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B", 5th floor, SEM.R. DB gelb 05 B

Interaction of slow electrons with matter for nanoscale characterisation of solids

Electron spectroscopy represents one of the most popular tools for surface analysis. The interpretation of electron spectra acquired by means of methods of electron spectroscopy requires the knowledge on the interaction processes of electrons with matter. In this work, the investigation of electron transport in solids is performed by means of two approaches: the invariant imbedding method and the Monte Carlo simulation. The former approach is employed in problems of the interpretation and analysis of energy spectra of complicated multi-component materials such as graphene oxide. The possibility of the detection of light elements, including hydrogen and its isotopes, in di_erent targets by means of elastic peak electron spectroscopy (EPES) is demonstrated. The latter approach is employed for the investigation of the secondary electron emission phenomenon. Unfortunately, electron emission is still far from being quantitatively understood which is partly due to the experimental di_culty associated nwith the investigation of very low energy electrons. From the theoretical point of view, secondary electron emission modeling at a few eV is complicated by the absence of reliable data on the electron-solid interaction at such low energies such as the inelastic mean free path (IMFP). It turns out that secondary electron yield (SEY) values at any incident energy depend sensitively on the IMFP values, in particular below 100 eV, which makes it possible to get a realistic estimate for the IMFP values at low energies by comparing calculated SEY values with experimental data during variation of the IMFPs. In this work, a Monte Carlo model has been developed to describe the process of secondary electron emission from solids and calculate the SEY. The determination of IMFPs at low energies (below 100 eV) from analysis of SEYs at high energies was successfully performed for several metals and the results indicate that the IMFP values based on the Mermin dielectric function are more realistic. Experimental investigation of the IMFP at low energies by means of EPES was also carried out and results on the IMFP determination for a polycrystalline gold are presented.

All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

Wolfgang Werner
(Seminar Chair)