
DS 12: Thin Film Analytics I

Time: Tuesday 14:30–15:15

Location: H34

Invited Talk

DS 12.1 Tue 14:30 H34

Surface Analytics with Monolayer Resolution using Ions

— ●PEDRO GRANDE¹, AGENOR HENTZ¹, RAFAEL PEZZI¹, ISRAEL BAUMVOL¹, and GREGOR SCHIWIEZ² — ¹Instituto de Física da UFRGS, Porto Alegre, Brazil — ²Hahn-Meitner-Institut, Abteilung SF4, Berlin, Germany

Determining the depth distribution of the different chemical elements near and at the surface of solids is of major relevance for many aspects of nanotechnology. In principle, this can be accomplished quantitative with deep subnanometric depth resolution, using ion scattering at energies corresponding to the maximum ion energy loss and high-energy resolution detection systems. The method is called medium energy ion scattering (MEIS), and is currently used for near-surface

elementary profiling in amorphous thin films and to investigate surface crystallography and surface reconstruction and dynamics. However, the simple data analysis framework successfully used for other low-resolution backscattering techniques (such as RBS) is not applicable to MEIS, since the much higher energy resolution of MEIS reveals new spectral features. The most relevant one is that in the first few nanometers below the solid surface the ion energy loss departs from a symmetric, Gaussian distribution. We propose an analytical formula for the line shape to replace the usual Gaussian distribution widely used in low-resolution ion-beam analysis. Furthermore, we provide a simple physical method to derive the corresponding shape parameters. We also present a comparison with full coupled-channel calculations as well as with experimental data at nearly single collision conditions.