Seminar general

Thin film analysis using heavy-ion elastic recoil detection analysis and PIXE studies with high-resolution X-ray detectors

Prof. Timo Sajavaara

Department of Physics, University of Jyväskylä, Finland

In thin film research, the detailed knowledge of the composition is the key in understanding the properties, such as conductivity, density and mechanical properties of the thin films. Atomic layer deposition (ALD) is an increasingly popular technique in semiconductor industry. In the early years, mostly Rutherford backscattering spectrometry (RBS) and nuclear reaction analysis (NRA) were used to characterize ALD films. Today the most versatile tool is the time-of-flight elastic recoil detection analysis (TOF-ERDA), which can be used for quantitative depth profiling of all elements in thin films, including hydrogen. TOF-ERDA can reach depth resolution of 2 nm or better without the need for reference samples or any prior information of the sample under study.

In this talk, the most recent ion beam analysis instrument and software development carried out in Jyväskylä for improvement of thin film analysis will be discussed. Also the potential of the latest analysis tool in Jyväskylä, the transition edge sensor (TES) with 3 eV energy resolution [1] in particle induced X-ray emission (PIXE) measurements, will be discussed. Unlike for instance X-ray Photoelectron Spectroscopy, this technique does not suffer from the surface or sputtering induced artifacts and using TES-PIXE the chemical environment of the elements can be studied over the whole film thickness.

[1] M.R.J. Palosaari, K.M. Kinnunen, J. Julin, M. Laitinen, M. Napari, T. Sajavaara, W.B. Doriese, J. Fowler, C. Reintsema, D. Swetz, D. Schmidt, J. Ullom, I.J. Maasilta, *Transition-Edge Sensors for Particle Induced X-ray Emission Measurements*, Journal of Low Temperature Physics 176 (2014) 285

Luni 21 martie 2016, ora 10⁰⁰
Biblioteca Naţională de Fizică, sala etaj 1