Nanostructured materials for device applications

Stefan Heun

TASC-INFM Laboratory, Area Science Park, Basovizza, S.S. 14, Km 163.5, 34012 Trieste (TS), Italy

The rapid progress of experimental techniques with access to chemical composition, electronic structure, magnetization, and fluctuations in these properties at the sub-micron level has been driven by the demand imposed by the continuous miniaturization and increasing complexity of nanostructured materials used in modern technology. X-ray photoelectron spectroscopy in combination with photoemission electron microscopy (PEEM) is among the techniques which can provide this information.

In my talk I will discuss the properties of selected nanostructured material systems with possible device applications which we have studied in the last years by PEEM and which illustrate the potential of this method in a particular way:

1. We investigated the chemical composition of semiconductor quantum dots (InAs/GaAs and Ge/Si). Concentration maps across individual islands were obtained which provide insight in the intermixing process which occurs during the growth of such islands.

2. The work function and the band bending of individual single-walled carbon nanotubes were studied. This is essential for understanding the electrical contact between a metal electrode and the nanowire.

3. We studied the chemical composition of nanostructures created by local anodic oxidation with an atomic force microscope on Si- and GaAs-substrates.