Structural Properties of Semiconductor Nanostructures Determined via X-ray Anomalous Diffraction (DAFS) and Absorption (EXAFS)

Maria Grazia Proietti[2], Johann Coraux[1], Hubert Renevier[1], Vincent Favre-Nicolin[1], Cristele Monat[3], Michel Gendry[3], Bruno Daudin[1], *[1]CEA, DRFMC-SP2M, Grenoble, France. [2]Dep. Física de la Materia Condensada-ICMA, CSIC-Universidad de Zaragoza, Spain. [3]LEOM, UMR-CNRS 5512, Ecole Centrale Lyon, France. LENAC, Université Lyon I, France*. E-mail: Hubert.Renevier@cea.fr

We will report novel results on the structural properties of encapsulated semiconductor nanostructures obtained by an ultimate application of anomalous diffraction combined with ray absorption spectroscopy. We have been studying InAs/InP Quantum Sticks (QSs) and GaN/AlN Quantum Dots (QDs). Reciprocal space mapping and fixed-Q anomalous diffraction, mesured as a function of energy, in grazing incidence, gives access to the the partial structure factor of the embedded nanostructures (QSs or QDs), allowing to determine their size, strain and atomic composition. Quantitative analysis of the Grazing Incidence Diffraction Anomalous Fine Structure (GIDAFS) oscillations above the resonant edges, gives strain accommodation and coordination at a local atomic scale for the diffraction-selected iso-strain region inside the nanostructures. On the other hand EXAFS measurements provide a comparison with the average atomic environment in the whole island. These methods have been applied succesfully both to InAs sticks and to the GaN dots.

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