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## Surface et interface


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# Structural properties of semiconductor nanostructures studied by Multiwavelength Anomalous Diffraction and Diffraction Anomalous Fine Structure Spectroscopy

The knowledge of strain, chemical composition, inter-mixing at the interfaces, are of great importance to understand the growth mechanism as well as the electronic and optical properties of hetero- and nanostructures [1]. To be suitable for devices, the nanostructures are encapsulated or embedded in a superlattice, the capping plays a decisive role in the modification of the optical properties by modifying the strain and possibly inducing atomic diffusion.

Strain is closely related to composition, shape and aspect ratio of the nanostructures, and on the mutual stress which nanostructures, substrate and the matrix apply to each other. The combination of Multiwavelenght Anomalous Diffraction (MAD) and Diffraction Anomalous Fine Structure (DAFS) which allows to determine the local environment of atoms located in an iso-strain volume selected by diffraction, is a powerful approach to disentangle strain and compostion [2, 3]. Like x-ray Absorption Fine Structure (XAFS), DAFS provides information about the local environment of the resonant atom (also known as the anomalous atom). We will give a brief insight on the basic principles of the MAD and DAFS methods and report on the structural properties (strain, composition) of free standing or capped nanostructures studied by grazing incidence MAD and grazing incidence DAFS. We will show results regarding GaN/AlN Quantum Dots (QDs) covered with an increasing AlN cap thickness [4, 5], capped InAs/InP Quantum Wires [1] as well as Ge/Si QDs. We will also give a comparison with glancing angle x-ray absorption studies and show the complementarity of XAFS and DAFS


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