X-Day Diffraction from Semiconductor Nanostructures

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Self-organized nanostructures are of great interest in semiconductor technology due to the enhancement they introduce for device design. Quantum confinement effects and the combination of different materials lead to electronic states that cannot be realized using bulk materials or planar heterostructures. Key properties of nanostructures, such as chemical composition, shape, size, and strain state, depend sensitively on growth conditions.

X-ray diffraction techniques have been successfully used for the characterization of such nanostructures, both after growth as well as in situ during fabrication [1]. The main advantages of x-ray techniques are that they can be applied to capped structures, that they provide statistically well averaged results, and the high sensitivity to lattice strain.

In this presentation, the techniques used for the structural characterization of nanostructures will be discussed, together with recent results in particular on SiGe islands embedded in Si samples. The composition and strain distribution within the nanostructures is derived from reciprocal space maps recorded in coplanar or grazing incidence diffraction (GID) geometry. Anomalous scattering is used to obtain material sensitivity even in the case of GID.

[1] *for a review see:* Stangl J., Holý V., Bauer G., *Rev. Mod. Phys.*, 2004, **76**, 725, *and references therein*.

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