Advanced characterization of the crystal lattice in Group IV quantum wells

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Quantum wells made of Si, Ge, Sn and their alloys are experiencing a Reinassance, thanks to their possible use in advanced devices such as semiconductor-based qubit, MQW and quantum cascade lasers. For all these applications, it is required to control the composition and strain profile of the quantum well at the sub-nm scale and over the typical size of the substrate, which might reach the diameter of 300 mm. In this talk I will describe how advancement in the Scanning X-ray Diffraction microscopy and in Electron Microscopy Tomography techniques can provide a complete, spatially resolved, description of the QW lattice in the Si/SiGe, Ge/GeSi material systems. These gained knowledge provides valuable insights for quantum computing[1,2] as well as optoelectronic applications [3].

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