3D characterization of nanostructures using MEIS

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Medium energy ion scattering (MEIS) is an ion beam characterization technique capable of determining with sub-nm depth resolution elemental composition and concentration-depth profiles in thin films [1]. This technique is widely used for analysis of microelectronic materials as well as for the determination of structural and vibrational parameters of crystalline surfaces. The former application exploits its high-energy resolution whereas the latter is achieved by measuring angular dips originated from shadowing and blocking effects[2]. More recently, the MEIS technique was used as an additional tool for the characterization of shape, composition, size distribution and stoichiometry from surface located nanoparticles (Nps) systems [3].

We demonstrate the use of MEIS for the characterization of nanostructured materials through the software PowerMeis [3]. This MEIS application is unique, and in case of elemental depth profiling in Nps, is hardly achieved by any other analytical technique. In particular it is powerful technique to characterize 3D structures as arrays of trenches and fins used to build 3D transistors. Here we investigate shallow trench isolation (STI) samples that present various trench densities obtained through chemical mechanical polishing (CMP) process.

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