Metrology for nanoscale complex semiconductor systems

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Pushing the limits in IC-technology towards the nanometer scale, led to the development of complex systems and 3D-devices (like Finfets, TFET, nanowires) whereby novel materials and in particular interfacial interactions and ultrathin layers play a crucial role. In many cases blanket experiments no longer reflect the fundamental processes operative in small volumes among others due to the influence of the dramatic changes in surface/bulk ratio's. This has emphasized the importance of metrology apt to deal with small 3D-volumes and atomic scale observations. Novel metrology concepts such as Atomprobe tomography, Scalpel SPM are emerging as a solution to these technological needs. Concurrently a parading shift is observed shifting metrology from high spatial resolution measurements on individual devices towards ensemble measurements on many devices simultaneously, in order to provide statistically relevant information. By exploiting some of their basic physics (cluster emission, photonic effects, detailed data algorithms) large area metrology concepts (SIMS, Raman, Four point probe) can be applied for ensemble measurements on small devices, despite their apparent lack of spatial resolution.