Transmission Electron Microscopy of Interface Phenomena in Functional Nanomaterials

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High-resolution imaging and spectroscopic techniques of advanced transmission electron microscopy (TEM) play a crucial role in characterizing the structure-property relationships of inorganic functional materials and interfaces. Three areas illustrating the superior potential of these methods will be addressed:

(i) Quantitative precision analyses by aberration-corrected high-resolution TEM of growth and interface phenomena for a (PbS)$_{1.14}$NbS$_2$ chalcogenide misfit compound with incommensurate interfaces; $^{1,2}$

(ii) Microstructure analyses of growth and doping phenomena by TEM and by scanning (S)TEM in combination with energy-dispersive X-ray spectroscopy of ZnO $^3$ and In$_2$O$_3$ $^4$ semiconductor nanowires and in situ TEM studies of melting phenomena of metallic cores in ZnO nanotubes $^5$;

(iii) Applications of imaging and spectroscopic methods of TEM and STEM in developing novel concepts for fabricating multi-junction III-V semiconductor solar cells on Ge cells and on Si cells $^6$-$^9$ that are used in concentrator photovoltaics.

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