

The molecular evolution of ZnO sequential infiltration synthesis

High resolution scanning transmission electron microscopy (STEM) of ZnO clusters and nanoparticles grown within polymethyl methacrylate (PMMA) films using 1 cycle of TMA/H₂O that create AlO_x nucleation sites, followed by one, three, or five DEZ/H₂O SIS cycles. The images show the development of nanoparticles within the film and the onset of crystallinity from very early in the growth process (yellow circles). The average particle size together with microgravimetric measurements enabled to probe the growth rate and its mechanism. The number of near neighbors, measured by X-ray absorption near edge structures (XANES), show excellent agreement with the development of Wurtzite structures, as probed by the high resolution STEM.

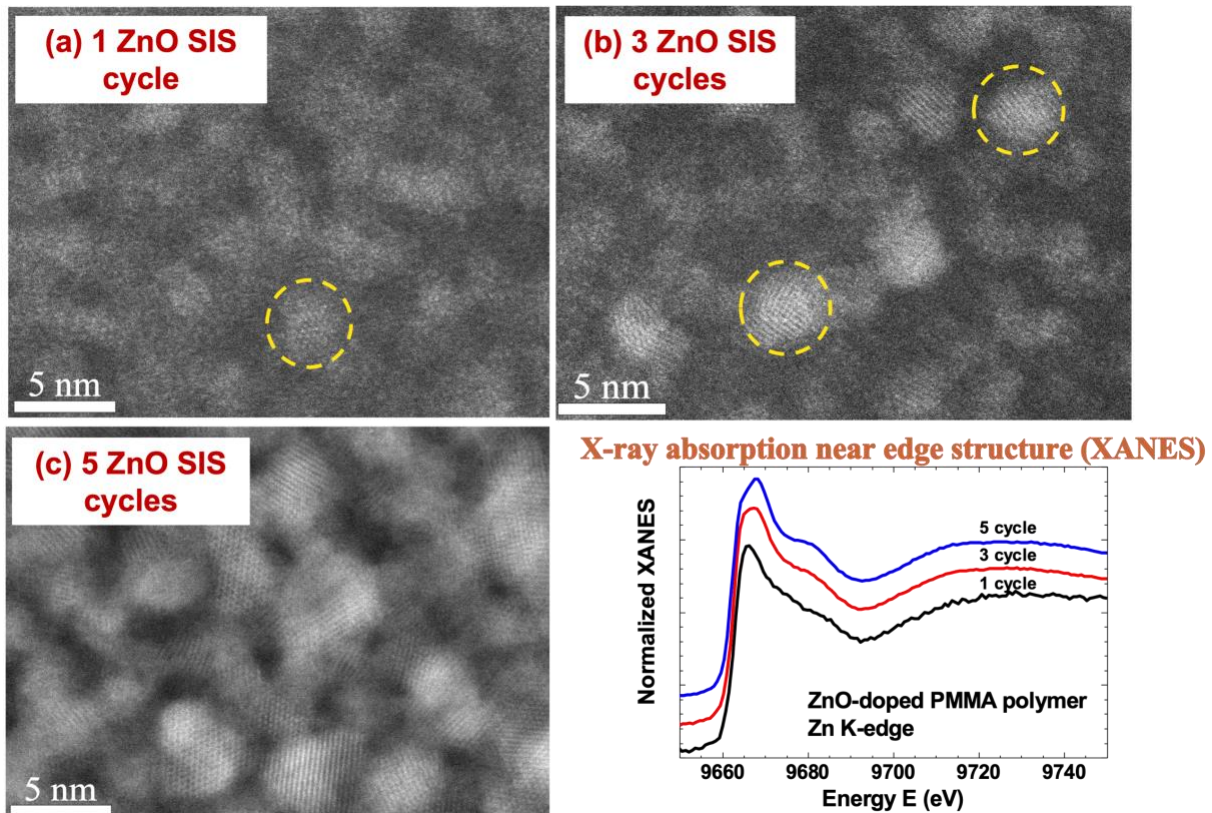


Figure 1: STEM imaging of ZnO clusters and nanoparticles grown within polymethyl methacrylate (PMMA) films using 1 cycle of TMA/H₂O followed by (a) 1, (b) 3, and (c) 5 DEZ/H₂O SIS cycles. Bottom right figure shows the corresponding XANES spectra.