142t Conformal Coating of Ceramic Nanoparticles Via Atomic Layer Deposition

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Primary ceramic nanoparticles were conformally coated with nanothick alumina films using Atomic Layer Deposition (ALD). Titania, Silica and Zirconia nanoparticles were uniformly coated in a fluidized-bed reactor at low pressure and under mechanical vibration. This process yields nanothick films that are conformal, non-granular and pin-hole free. The self-limiting, self-terminating characteristics of ALD allows for a precise control over the film thickness. The coated powders are characterized by transmission electron microscopy (TEM), ex-situ Fourier Transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) and energy dispersive spectroscopy (EDS). Nanoparticles fluidized as dynamic aggregates that constantly break apart and reform during fluidization. The particle size distribution and specific surface area of nanoparticles is not affected by the ALD nanocoating process.

Keywords: Atomic Layer Deposition, Fluidization, Nanoparticles, Ultrathin films, Dynamic aggregation