287f Optical Effects of Nano-Thick Coatings on Particles of the Core-Shell Type

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Functionalized nanoparticles have become popular additives to innumerable types of dispersions across many industries for the efficacy of desired surface properties, while retaining bulk particle characteristics. Atomic Layer Deposition (ALD) is one such method of creating particles of the core-shell type. ALD involves a two-step surface reaction technique that allows precise oxide shell growth on particles in conformal nanolayers. Optical effects of core SiO_2 particles have been studied in the UV regime, coated with shells of known absorbing (TiO_2, ZnO) and non-absorbing (Al_2O_3) oxide materials. Absorbance, reflectance and refractive index were measured for various oxide shell thicknesses, and a model was generated to help predict these effects. Subsequent work involved an analysis of shells consisting of multiple oxide types and thicknesses on single SiO_2 particles to determine how tunable the optical properties of ALD nano-laminates can be. Optically controlled protective coatings on particles of the core-shell type can be utilized in a plethora of applications, including as additives in window/windshield glass and in fluid dispersions such as sunscreens and paints. ALD nano-laminates may offer significant improvement and tuning flexibility to single-shell particles used as optical filters.