Highly Transparent, Antireflective and Antifogging Coatings Composed of TiO_2 and SiO_2 Nanoparticles

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We report the results of fabrication and characterization of highly transparent, antireflective and antifogging coatings fabricated on glass substrate by sol-gel reaction of TiO2 nanoparticles (NPs) and layer-by-layer (LbL) deposition of Stöber type and/or mesoporous SiO2 NPs. First, TiO2 NPs were prepared by adding water to alcoholic solution of titanium alkoxide precursor with a controlled reaction rate, and a glass substrate was then dip-coated with the TiO2 sol. Second, Stöber type and/or mesoporous SiO2 NPs prepared by sol-gel processes were deposited onto the top of the TiO2 layer with the aid of polymer solutions of cationic polydiallyldimethylammonium chloride (PDDA) and anionic polystyrene sulfonate (PSS). As results of transmittance, reflectance and contact angle measurements, the fabricated coatings were found to have very high transparency, effective antireflection, and desirable antifogging properties. These multifunctional coatings are promising surface films for the purpose of enhanced light harvesting of photovoltaic cells, improved visibility of display devices, and self-cleaning/antifogging of various windows.