

Particulate structures produced by electrosprays of colloidal silica suspensions in both negative and positive zeta potentials

ABSTRACT

Interaction between surface charge (zeta potential) of colloidal silica nanoparticles and the charge-induced droplets suspended in the gas phase by electrospray is investigated for the first time based on the particle physical (morphology, size, and size distribution) and optical properties. Colloidal silica nanoparticles having negative and positive zeta potential were subjected to electrospray in both negative and positive mode, and deposited on a substrate (silicon wafer). Visual observation of the substrate with particle deposition shows various white shades, corresponding to the changes in optical properties, as supported by the ultraviolet-visible–near-infrared spectroscopy. Microscopic analysis revealed the strong correlation between the colloid surface charge and charging mode (positive or negative) of the sprayed droplets to the particle morphology and size. The findings of the present study demonstrate the capability of the electrospray method to tune the physical and optical properties of colloidal silica nanoparticles with different surface charges.