

Effect of anion electrolytes on the formation of silica nanoparticles via the sol–gel process

Abstract

Anion electrolyte additives (ammonium salts) have been used for the first time to study the effect on the morphology development of nanometer, monodispersed silica particles by the sol–gel process. The phenomena can be explained by conductivity profile during the process as alternative to normally use zeta potential. Under experimental conditions where TEOS, water, EtOH and feed rate were fixed and without additives, unstable silica particles of ~30 nm were formed at a ratio of $\text{TEOS}/\text{NH}_3 \geq 0.6$, below that particles from 90 to 250 nm were obtained. However, upon the addition of small amount of anion electrolytes, monodispersed nanosilica powders with particles ranging from ~20 to ~34 nm were obtained depending on the type and concentration of anions added. It was found that all anions were able to reduce the particle size by 73–78%, among them, Br^- and I^- have the highest effect while Cl^- has the least effect. The synthesized silica powder was free from cation impurities.