

## **An optimized sol–gel synthesis of stable primary equivalent silica particles**

### **Abstract**

An optimized synthesis of nanometer silica particles via hydrolysis and condensation of tetraethylorthosilicate (TEOS) is described. At the optimum experimental conditions, homogeneous and stable silica nanoparticles with mean particles size of  $7.1 \pm 1.9$  nm were obtained. The particle size is in a good agreement with primary particles. The size, size distribution (SD) and the yield of silica were controlled by the concentration of the reactants, ammonia feed rate, temperature and mixing mode. The increase in TEOS concentration resulted in bigger and multi-modal distributed powder, while high temperature and magnetic agitation produced a highly aggregated powder. However, higher H<sub>2</sub>O/TEOS ratio and lower ammonia concentration at slower feed rate produced particles in the range of 10–14 nm. It was also found that the concentration of silanol group increased significantly with the decrease in particle size, especially below 40 nm. The optimized technique developed is simple and reproducible, affording a high yield of ~75% of nanometer silica in a primary size range.