Preparation and characterization of silica nanoparticles via the sol-gel method

S. N. M. Mestanza[1], A. O. Ribeiro[1], M.T. B. Milesi[1], F. Duft[1], A. C. G. Rocha[1], A. Ribera[2] and G. Giunta[2]

[1] *Federal University of ABC (UFABC), Santo André, SP, Brazil*
[2] *Instituto de Ciencia Molecular (ICMol), Universidad de Valencia, Valencia, Spain*

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Silica nanoparticles (NP) were synthesized using the Stöber method. The reaction entails the hydrolysis and condensation of TEOS in aqueous solution of ethanol and water.
Stöber *et al* [1] published a synthetic process for the fabrication of monodisperse silica particles via hydrolysis of tetraethylorthosilicate (TEOS) in an alcohol solution. This reaction is catalyzed by ammonia. Hydrolysis and condensation of alkoxide silicon led to monodisperse spheres of silica. In present work, we synthesized spherical and monodisperse SiO_2 particles in a range of 100 nm to 500 nm using sol-gel processes.
Optical and morphological properties of silica NP were studied experimentally. The size and the particle size dispersion were precisely tuned by the initial mole ratio of reactants. Ammonia and ethanol are the most effective to control the size of the NP.
These NP have been funcionalized with aminopropyltriethoxypropane (APTES). The various vibration modes of different functional groups in the funcionalized silica were revealed by Fourier transform infrared (FTIR) spectroscopy. The morphologies of the obtained products were characterized by both transmission electron microscopy (TEM) and scanning electron microscopy (SEM).
Fig. 1 depicts the average pH versus time following a growth of silica NP. Fig. 2 shows the silica NP morphology characterized using TEM.

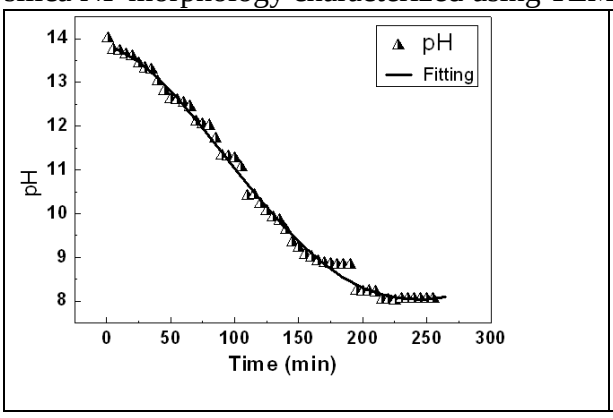

Fig. 1 Average pH versus time of growth of silica

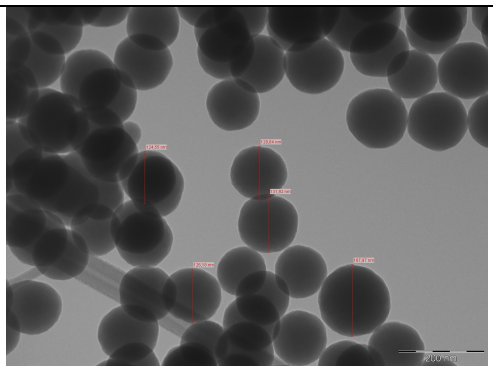

Fig. 2 TEM images of a typical silica NP

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References

[1] W. Stöber, A. Fink and E. Bohn, J. Colloid Interface Sci. **26**, 62 (1968).

Corresponding author, electronic mail: nilo@ufabc.edu.br