

NOVEL ONE-POT SYNTHESIS OF ORGANIC-FUNCTIONALIZED SILICA NANOPARTICLES

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This research project focuses on the study and development of novel synthetic methodologies for the obtention of nanoparticles. In this poster, a convenient single step (one-pot) method is described for the preparation of nanoparticles bearing a wide range of organic functional groups.

Our route is based on well-known Sol-Gel methodology, particularly the Stöber method,¹ which is widely used to obtain silica nanoparticles under specific conditions involving base catalysis (Scheme 1).² For this, we have undertaken a study of methodology for the synthesis and functionalization of nanoparticles with a variety of functionalities (amine, phenyl, vinyl, etc.), comparing the novel one-pot method to the previously reported two-stage method,³ which requires an initial step for nanoparticle synthesis followed by functionalization in a second stage.

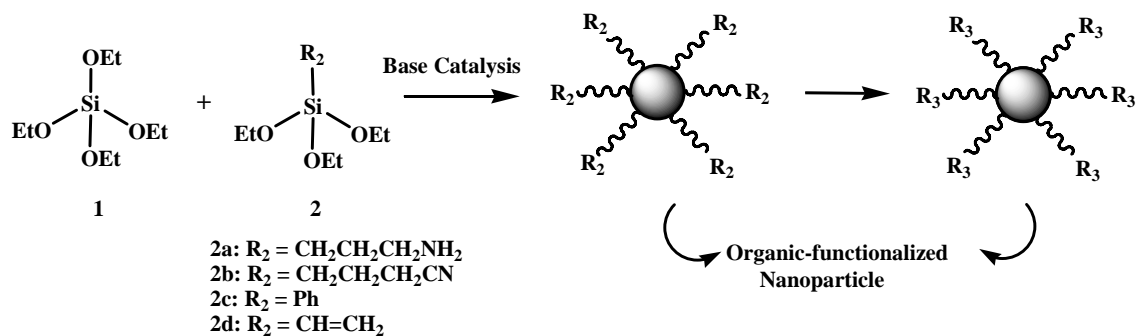
As a result of this novel method, stable colloidal suspensions of monodisperse silica nanoparticles with pendant organic moieties were successfully obtained; the size of these nanoparticles being in the range of 50 to 130 nm, as can be observed in the images obtained by Transmission Electron Microscopy (TEM) and Atomic Force Microscopy (AFM) (Fig 1).

In addition, ²⁹Si and ¹³C CP/MAS NMR spectra of these nanoparticles have been obtained in order to demonstrate the presence of the covalent bonding between the organic group and the silica nanoparticle (Fig 2).

References:

- [1] Stöber. W.; Fink. A.; Bohn. E.; *J. Colloid Interface Sci.*, **26** (1968) 62.
- [2] Brinker C.J.; Scherer G.W. (Eds.), “*Sol-Gel Science. The Physics and Chemistry of Sol-Gel Processing*”, Academic Press, San Diego (1990)
- [3] Yanqing, A.; Miao, C.; Qunji, X.; Weimin. L.; *J. Colloid Interface Sci.*, **311** (2007) 507.

Figures:



Scheme 1. Novel one-pot synthesis of organic-functionalized silica nanoparticles

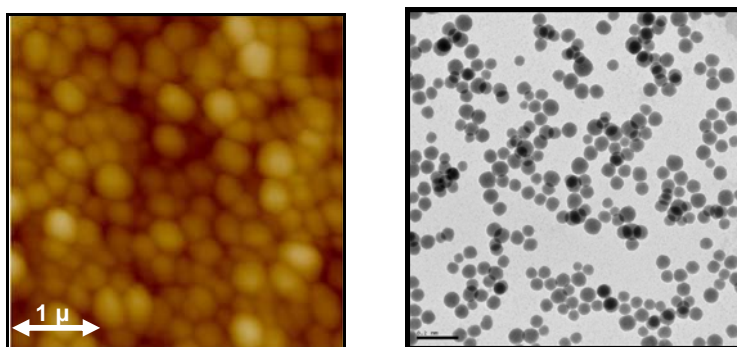
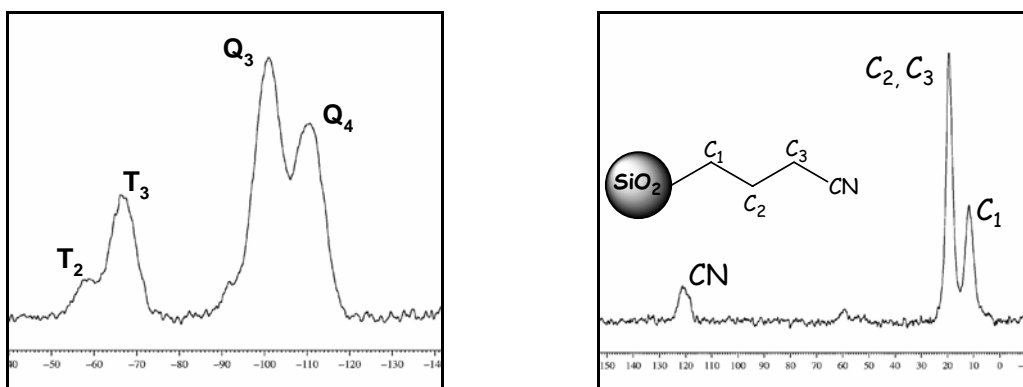


Fig. 1. AFM and TEM images of Cyano-functionalized silica nanoparticles

Fig. 2. ^{29}Si and ^{13}C CP/MAS NMR spectra of Cyano-functionalized silica nanoparticle