

Functional sol-gel materials with tunable properties

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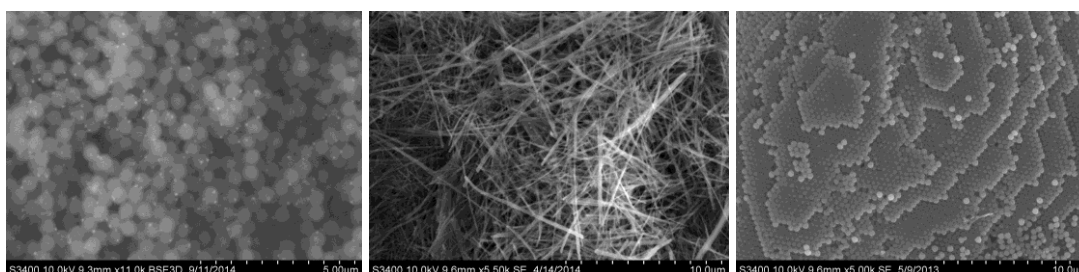
ABSTRACT

Important advantage of the sol-gel technology is the possibility of the silica and titania thin films and powders synthesis – especially in spherical and nanotubes form.

In this report we present silica and titania powders with clearly defined morphology and layers deposited on different supports. As a first example we show silica films on synthetic, aramid fibers which can be used as an effective gas (CO₂) permeation barrier. Second examples presented here are functionalized with active substance (e.g. drugs) coatings improving physicochemical, mechanical and biological properties of metallic substrates (e.g. SS 316L, titanium alloy) used for implants.

The representative examples of powder materials presented in this report are silica spherical particles with diameter from 200 to 500 nm. This material can be functionalized with different (-CH₃, -C₂H₄, -NH₂, -SH) groups for surface activation. Interesting modification of silica powders is occlusion of metallic nanoparticles (ferromagnetic cobalt) or creation of metallic nanoislands on their surface. Silica submicron spheres doped with silver or copper show bacteriostatic or fungicidal properties. Active silica powder after impregnation on the textile-polymeric coating materials presents a wide range of practical applications including clothing or health preventive effect.

A further interesting materials presented here are titania tabular powders in the form nanotubes, nanowires and nanoribbons. Such materials exhibit high active surface area giving them perspective catalytic and biological properties.



keywords: the sol-gel method, thin films, submicron spheres, nanoparticles, nanofibers magnetic, biological properties.

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