SIZE TUNING AND OXYGEN PLASMA INDUCED PORE FORMATION ON SILICA NANOPARTICLES

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Silica nanoparticles (SNPs) occupy a prominent position in scientific research because of their easiness in preparation and enormous uses in various applications [1]. Porous silica nanoparticles have a promising role in various drug delivery applications [2, 3]. Significant research progress has been made in controlling and modifying the properties of mesoporous silica materials since its discovery [4-6]. In contrast to the earlier reports of tuning the particle size by adjusting atleast four different parameters [7, 8], here we are reporting about our attempt to control the nanoparticle size by making variations in a single parameter; the concentration of ammonia solution. Silica nanoparticles of size ranging from 5 nm to 250 nm have been successfully synthesized by controlling only the concentration of ammonia solution keeping all other parameters (concentration of TEOS, ethanol and water) constant [Fig 1]. Oxygen plasma was found to be a successful direct tool for generating pores on silica nanoparticles without the use of any structure directing agent and our method proved to be very easy and time saving one [Fig 2]. The nature and morphology of nanoparticles were investigated by scanning electron microscopy, transmission electron microscopy, dynamic light scattering, energy dispersive X-ray spectroscopy and Fourier transformed infrared spectroscopy.

References:

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Figures:

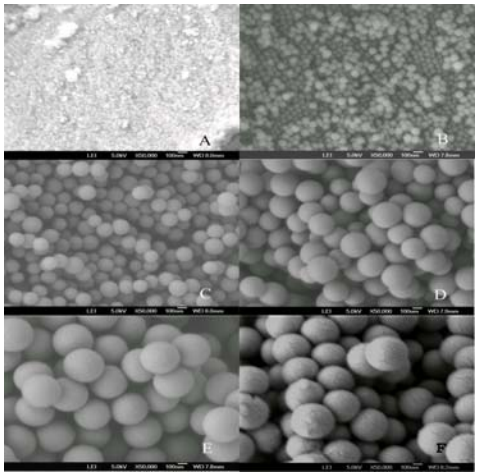

Fig 1: SEM images of silica nanoparticles at different concentrations of ammonia solution

A: Silica nanoparticles at 6% NH_3 solution (Average diameter: 9.16 nm)
B: Silica nanoparticles at 8% NH_3 solution (Average diameter: 67.81 nm)
C: Silica nanoparticles at 12% NH_3 solution (Average diameter: 137.66 nm)
D: Silica nanoparticles at 16% NH_3 solution (Average diameter: 216.62 nm)
E: Silica nanoparticles at 20% NH_3 solution (Average diameter: 242.07 nm)
F: Silica nanoparticles at 24% NH_3 solution (Average diameter: 257.03 nm)

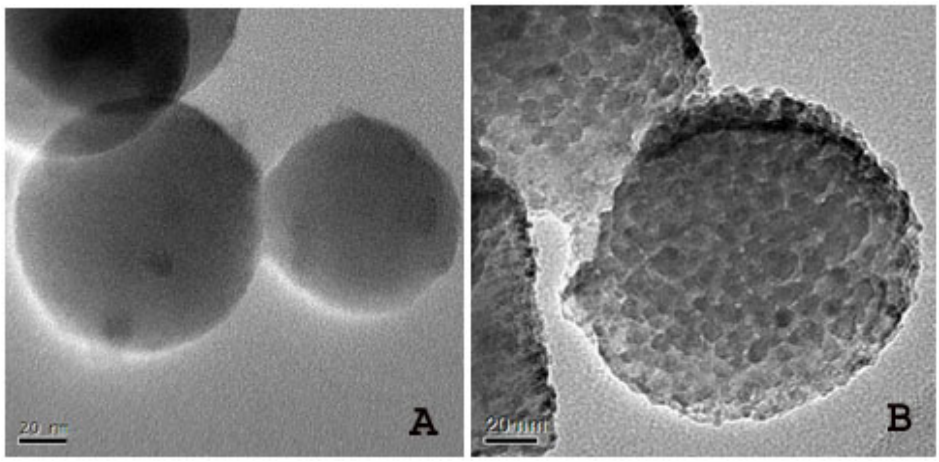

Fig 2: TEM image of silica nanoparticles with and without plasma treatment