

# The effect of adding selected electrolytes on the surface area of nano-sized silica particles

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*Abstract*

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## Introduction:

Chemically modified and functionalised silica nanoparticles are finding applications in many areas of science and technology. The surface density of the functionalisation can however be limited by the low surface areas (typically by BET 10-20m<sup>2</sup>/g) of silicas prepared by sol-gel chemistries based on the original Stober procedure. Here we report the effect of adding selected electrolytes on the surface area of nano-sized silica particles.

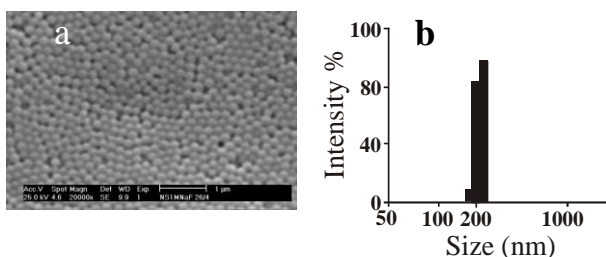
## Method:

1g of silica particles, prepared by alkoxy silane hydrolysis procedure, was washed and dried under vacuum, then transferred to a 50 ml polypropylene tube. 40 ml of (1M) electrolyte was added to the tube (method I). In method(II) the electrolyte was added during silica particles formation.

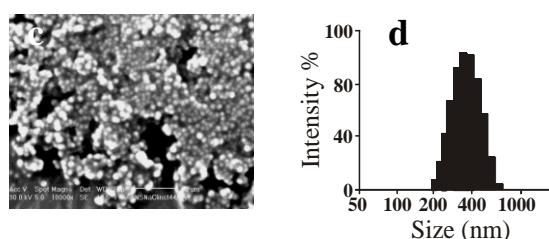
## Results and Discussion:

The study shows that addition of electrolyte during the particles formation has an obvious impact on the surface area, particles size and morphology comparing to adding electrolyte to pre-prepared particles. Furthermore, the adding of NaCl (1M) during the particles formation increases the surface area significantly.

| Batches  | Surface area, m <sup>2</sup> g <sup>-1</sup> | Total pore volume, cm <sup>3</sup> g <sup>-1</sup> | Average pore diameter, Å |
|--|--|--|--------------------------|
| Nanosilica without treatment   | 10.98  | 0.0257   | 93.71                    |
| Nanosilica treated with (1M) NaF                                       | 13.04  | 0.0309   | 114.5                    |
| Nanosilica treated with (1M) NaF during particles formation            | 6.49   | 0.0177   | 109.3                    |
| Nanosilica treated with (1M) NaCl during particles formation (1 hour)  | 49.3   | 0.1256   | 101.9                    |
| Nanosilica treated with (1M) NaCl during particles formation (24 hour) | 354  | 0.309  | 35.02                    |



**Fig 1:** SEM image of silica particles treated with 1M NaF (a) and the mean particle size distribution of the same sample(b)



**Fig 2:** SEM image of silica particles treated with 1M NaCl during particles formation (c) and The mean particle size distribution (d)