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Characterization of submicron sized fluorescent silica particles

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Silica nanoparticles and submicron particles are one of the most frequently modified and common uses materials. Various enhanced methods of the fluorescent particles preparations give the opportunities for applications of fluorescent SiO_2 as a model system for biomedical interactions between the particles and biostructures in colloidal systems such as cells. Fluorescent particles are usually made as a core-shell structures, where the fluorescent agent is included in core and then surrounded by protective shell. Nevertheless, for microscopic investigations are crucial to precise where exactly the fluorescent part is. Additional processes might occurred in core-shell fluorescent particles type i.e. fluorescent agent diffusion. In some applications the dye distribution within fluorescently labeled nanoparticles and its stability over long periods of time are important issues.

In present paper, fluorescent submicron silica particles were prepared by modified Stober technique [1,2]. As a fluorescent agent Rhodamine-B isothiocyanate was used. The core-shell tunneling size structure was formed by addition of TEOS (tetraethyl orthosilicate) to the base mixture. The size of the particles were investigated by dynamic light scattering (DLS), nanoparticle tracking analysis (NTA), fluorescence correalation spectroscopy (FCS). Shape and morphology were studied by the transmission and scanning electron microscopy (TEM and SEM). The fluorescence behavior of the particles was confirmed using NTA in the fluorescent mode and LSM (laser scanning microscope). We focused at the examinations of the particles with the hydrodynamic diameter in the range between 300 – 1000 nm using the FCS technique. As we presented in the previous papers [3,4], in the case of submicron sized fluorescent particles investigations with FCS need a correction of the confocal volume. XRD spectra of fluorescent SiO_2 were also obtained.

In this study main differences between the fluorescent submicron particles characterization methods are pointed out according to the tips presented by Bell et al. [5].

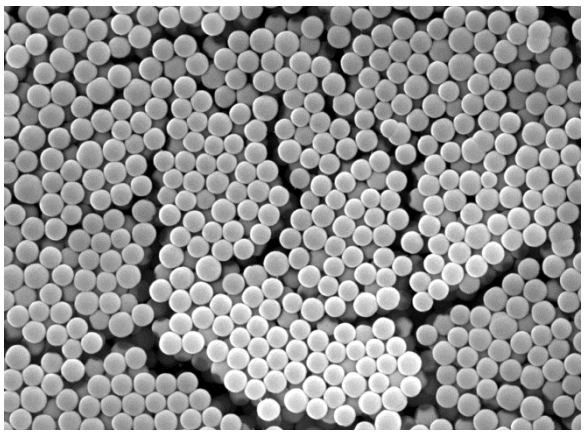

Figure 1. SEM image of fluorescent submicron silica particles.

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