# Mechanistic study of silica particle formation by time-resolved static and dynamic light scattering

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Formation of silica particles from supersaturated aqueous solution of sodium silicate is a fundamental mineralization process with broad relevance to technical applications as well as to biological processes. In order to contribute to a better understanding of the mechanism underlying particle formation under ambient conditions, a combined multi-angle static and dynamic light scattering study on the evolution of particle mass and size is applied for the first time in a time resolving manner. The light scattering experiments are complemented by a time-resolved analysis of the decay of the concentration of monomeric silicate by means of the silicomolybdate method [1]. Particle formation was investigated at variable concentration of silicate at a pH = 7 and a pH = 8. The joint experiments revealed two successive growth steps: Formation of nanoparticles via a monomer addition mechanism and an agglomeration of the resulting particles. The evolution of the weight averaged nanoparticle mass $M_w$ with time and the accompanying loss of monomeric silicate could successfully be described with a simplified nucleation and growth model [2]. The results serve as a reference system to categorize and appropriately discuss the impact of Ca/Mg-salt and of selected polymeric additives on the formation process, with which the present work is concluded.

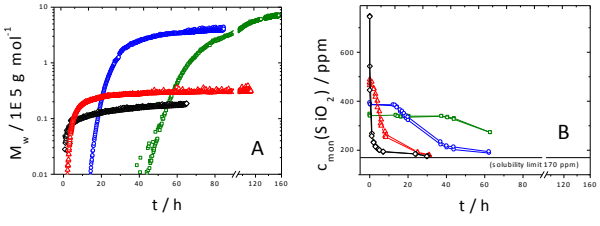


**Figure 1**: Formation of silica particles as a function of time in water at pH 7 at variable silica concentrations: 750 ppm (◇), 500 ppm (△), 400 ppm (○), 350 ppm (□). (A) Apparent weight averaged molar mass from SLS; (B) consumption of the monomeric silica [1].

[1] *Standard methods for the examination of water and wastewater;* American Public Health Association: Washington, D.C, 1998. [2] Tsapatsis et al. (2005) *J. Phys. Chem. B* **109** (50), 23879–23887.