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29. Formation and Stabilization of Silver Nanoparticles in the Presence of Cationic Polymers and Copolymers in Aqueous Media

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The development and research of new charged/cationic polymers plays a pivotal role in the creation of a new functional system; on the one hand are nanomaterials and on the other hand is the further development of theories and models to describe the polymer behavior. To further optimize the efficiency and implementation of charged polymer systems, detailed information regarding their molecular and conformational characteristics is indispensable.

A comprehensive study of cationic homopolymer poly(2-aminoethyl-methacrylate)s and ternary copolymer poly(AEMA-co-MAEMA-co-DMAEMA)stat over a wide range of molecular masses by methods of molecular hydrodynamics and optics was recently accomplished [1,2]. The ability of these cationic homopolymers and copolymers to stabilize silver nanoparticles (NPs) in different media (H₂O, 0.2 m NaOH) using NaBH₄ as a reducing agent was demonstrated using a set of the following methods: UV spectroscopy, dynamic light scattering, SEM and AFM.

The kinetics of nanoparticle formation in different conditions was studied by varying NP medias, concentration and component (silver salt and polymer) ratios. By varying the mentioned parameters, the formation of stable NPs was accomplished. Consistent information on the size of NPs was obtained. Thus, conclusions about the influence of the chemical structure and charge of the polymer on the ability of cationic polymers to stabilize silver NPs were formulated. Also, data on the influence of molecular mass on the kinetics of formation of NPs, the stabilizing ability of the polymers and the size distribution of the final nanoparticle was obtained.

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References:

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