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Spectral Investigation of Surface Plasmon Resonance Bands of Silver Nanoparticles Capped with Gallic Acid

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The study of silver nanoparticles fabricated more and more for textile industry, cosmetics, pharmaceutics and other utilizations has led to the diversification of synthesis protocols. First we present single pot reaction of silver nitrate with gallic acid, rather newly used as reducer, with focus on the influence of reaction parameters on the Surface Resonance Plasmon bands of resulted silver nanoparticles. Four experimental variants of chemical reduction were conducted at room and at 60 °C, at 7.5 pH and at 10.5 pH. Secondly, two phase photochemical reduction with gallic acid using UV exposure was carried out. The Surface Plasmon Resonance spectral band of silver nanoparticle suspensions was rather broad indicating dimensional polydispersion, while symmetrical shape and maximum position suggested dominant spherical nanosized particles. The study of aged samples yielded by one pot reduction revealed higher stability for alkali samples. In the case of photochemical synthesis, submicron particles in not stable suspension were revealed. To support spectrophotometric experimental data, Transmission Electron Microscopy imaging was done, revealing tens of nm particles in the case of chemical reduction but considerably larger particles, over 100 nm in the case of photochemical synthesis. The results discussion was based on the influence of reaction conditions (temperature, pH, UV exposure) on the silver particle spectral properties and also on the capping molecular shell.