

Methylviologen mediated electrosynthesis of gold nanoparticles in the solution bulk

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Abstract

© 2015 The Royal Society of Chemistry. Electrosynthesis of gold nanoparticles (AuNp) was carried out by methylviologen mediated reduction of Au(i) at potentials of the MV²⁺/MV⁺ redox couple in water/0.1 M NaCl medium, in the absence and in the presence of stabilizers. In all the cases, AuNp are formed in the solution bulk and are not deposited on the cathode. In the absence of stabilizers, AuNp (14-100 nm) coalesce to give aggregates of various shapes that eventually form a deposit. Sonication reversibly destructs the deposit into nanoparticles. In the presence of alkylamino-modified silicate nanoparticles (SiO₂-NHR, 120-160 nm), spherical AuNp (≤ 20 nm) are bound as inclusions in the SiO₂-NHR surface layer. Polyvinylpyrrolidone (40 000 D) stabilizes spherical AuNp with a mean diameter of 5-14 nm. All the particles were characterized by electron microscopy methods (SEM, STEM) and X-ray powder diffraction (XRPD).

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