

## **220d A Novel Thermal Electrochemical Synthesis Method for Production of Stable Colloids of “Naked” Metal (Ag) Nanocrystals**

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Solution synthesis represents an important method for nanocrystal synthesis. This paper reports a novel method, named “thermal electrochemical synthesis” (TECS), for producing metallic (Ag) nanocrystals as small as a few nanometers. The TECS method requires mild temperature conditions (0-100°C), low voltage potential (1-50 V DC) on electrodes, and simple water or aqueous solutions as reaction medium. Furthermore, a tubular membrane surrounded around the electrodes has been demonstrated to enable production of nanosized (<10 nm) pure metal (Ag) nanocrystals. Different from the other metal nanocrystals reported so far in the literature, our nanocrystals have several unique features: (1) small size (could be as small as a few nanometers), (2) “naked”, i.e., surfaces of metal nanocrystals are free of ligand capping organic molecules and no need of use of dispersant in reaction synthesis medium, and (3) colloidally stable in water solutions. In addition, it was discovered that Ag nanoparticles with initially large size distribution could be homogenized into near-monodispersed system by a low power laser exposure treatment. The combination of TECS technique and laser treatment could lead to a unique technology that produces metal (Ag) nanoparticles that are naked, stable, and truly uniform sized. It is also observed that in the presence of stabilizing agent (and also as supporting electrolyte) such as polyvinyl alcohol (PVA), larger yield of silver nanoparticles (<100nm) in the form of thick milky sols are produced.