

# Surfactant Induced Reductant-Free Synthesis of Silver Nanoparticles in Hydrothermal Condition

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In the past two decades, the use of noble metal nanoparticles in various fields has increased dramatically. Silver nanoparticles, in particular, are of great interests and have the potential to be the building blocks of future plasmonic devices and printed electronics as the field of nanotechnology matures. A requirement for this progress is the development of a synthetic method that can reliably produce silver nanoparticles. With the increasing emphasis on the topic of green chemistry and chemical processes over the past two decades, researchers have begun to develop more environmentally benign and sustainable methods for the synthesis of silver nanoparticles.

Herein, we present a facile and green method for preparing silver nanoparticles in hydrothermal conditions. This environmentally friendly chemistry approach requires only two reagents, silver precursor and surfactant. A yellow colloid was obtained when the silver precursor was hydrothermally treated only in the presence of the surfactant, as shown in Fig.1a. In its UV-Vis spectrum (Fig.1b), the maximum peak position was around 400nm representing the dipole component of the plasmon resonance of the silver nanoparticles with average particle diameter of 24.6nm as shown in Fig.1c. The crystalline nature of the silver nanoparticles was confirmed by the SAED pattern (Fig. 1d), which showed the quasi-ring-like diffraction pattern, demonstrating that the polycrystalline structure was formed, and the (111), (200), (220) and (311) rings were indexed to the face-centered cubic fcc crystal structure of silver. The average diameter of these nanoparticles can be greatly adjusted by varying aging time and temperatures.

In this presentation, we will show the effects of different kinds of silver precursors and surfactants on production of silver nanoparticles in hydrothermal conditions. Then, we will propose the synthetic mechanism of our green chemistry method.

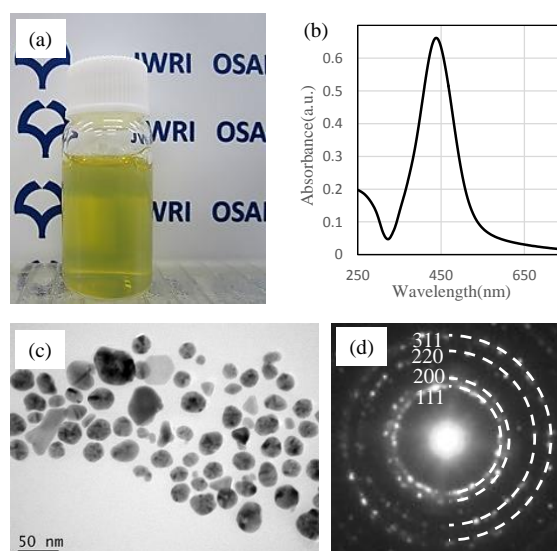


Figure 1. (a) A colloidal solution of Ag NPs, (b) UV-Vis spectrum of the colloidal solution, (c) TEM image of Ag NPs dispersed in the colloidal solution, (d) SAED pattern

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