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Dual Function of *p*-Hydroxybenzoic Acid as Reducing and Capping Agent in Rapid and Simple Formation of Stable Silver Nanoparticles

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Abstract : This paper highlights the fact that *p*-hydroxybenzoic acid has a dual function as reducing and capping agent in the formation of stable silver nanoparticles. The first step of the formation of silver nanoparticles was an adjustment of the pH of the *p*-hydroxybenzoic solution by the addition of sodium hydroxide solution. Silver nitrate was then added to pH adjusted *p*-hydroxybenzoic and the mixture was then heated for 1 hour in boiling water bath. Reduction of Ag^+ to form silver nanoparticle was monitored using a UV-visible spectrophotometer. Interaction of *p*-hydroxybenzoic acid with silver nanoparticles in capping silver nanoparticles was determined by Fourier transform infrared spectrophotometry. The size and morphology of silver nanoparticles were determined by transmission electron microscopy. The data showed that the pH of *p*-hydroxybenzoic acid had an effect on the reducing ability of *p*-hydroxybenzoic acid. At pH of *p*-hydroxybenzoic acid equal to 11, the reaction with a mole ratio of $AgNO_3$:*p*-hydroxybenzoic acid 1:20 resulted in the formation of silver nanoparticles with the average size of 26±11 nm. Stability observation for 18 weeks at normal laboratory condition showed that the silver nanoparticles were highly stable with the reduction of surface plasmon resonance peak intensity only 1% and no significant shift of the maximum peak. The results suggest the *p*-hydroxybenzoic acid can be used as reducing agent in the formation of stable silver nanoparticles without additional another capping agent. These silver nanoparticles show a promising application in the development of antibacterial product and chemical sensor.

Keywords : Silver nanoparticles; *p*-hydroxybenzoic acid; surface plasmon resonance.

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