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Synthesis and Characterization of Spherical Gold and Silver Nanoparticles

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Syntheses of gold and silver nanoparticles have gained immense interest in the field of applied chemical research. This is because of the numerous and exciting physical and chemical properties of these nanomaterials. In this paper, gold nanoparticles (AuNPs) were prepared by citrate reduction method where by trisodium citrate acted as both reducing and capping agent, while silver nanoparticles (AgNPs) were prepared using sodium borohydride as a reducing agent, with trisodium citrate as a capping agent. The optical properties of the synthesized AuNPs and AgNPs were investigated by UV-Vis absorption spectroscopy where the surface plasmon resonance peaks were recorded at approximately 520 nm and 400 nm for AuNPs and AgNPs respectively. Transmission Electron Microscope (TEM) was employed in checking the morphology of the particles and size determination. For AuNPs the sizes were 14 nm, 20 nm and 40 nm for the samples PS01, PS02 and PS03, respectively, while for AgNPs they were 9.4 nm, 12.4 nm, 10.2 nm and 16.5nm for the samples PS06 ,PS07, PS08, and PS09, respectively. The surface charge of these nanoparticles was investigated by measuring the zeta potentials. The AuNPs were found to be negatively charged. Also, a study was performed to investigate the influence of reducing agents concentration on size of AuNPs and found that high concentrations of citrate led to smaller size of AuNPs. Application of silver nanoparticles (Ag NPs) in organic photovoltaic devices is of considerable interest. Surface plasmon resonance in Ag NPs offers great promise to enhance the power conversion efficiency (PCE) of organic solar cells as it exhibits strong local field enhancement around the Ag NPs. The nanoparticle can increase light scattering and absorption in the organic film.

Key words: Gold and Silver nanoparticles, Surface plasmon resonance (SPR), zeta potentials, organic photovoltaics (OPVs), power conversion efficiency (PCE).

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