

Bimetallic Silver-Platinum Core-Shell Nanoparticles Formation and Spectroscopic Analysis

Authors : Mangaka C. Matoetoe, Fredrick O. Okumu

Abstract : Metal nanoparticles have attracted a great interest in scientific research and industrial applications, owing to their unique large surface area-to-volume ratios and quantum-size effects. Supported metal nanoparticles play a pivotal role in areas such as nanoelectronics, energy storage and as catalysts for the sustainable production of fuels and chemicals. Monometallics (Ag, Pt) and Silver-platinum (Ag-Pt) bimetallic (BM) nanoparticles (NPs) with a mole fraction (1:1) were prepared by reduction / co-reduction of hexachloroplatinate and silver nitrate with sodium citrate. The kinetics of the nanoparticles formation was monitored using UV-visible spectrophotometry. Transmission electron microscopy (TEM) and Energy-dispersive X-ray (EDX) spectroscopy were used for size, film morphology as well as elemental composition study. Fast reduction processes was noted in Ag NPs (0.079 s⁻¹) and Ag-Pt NPs 1:1 (0.082 s⁻¹) with exception of Pt NPs (0.006 s⁻¹) formation. The UV-visible spectra showed characteristic peaks in Ag NPs while the Pt NPs and Ag-Pt NPs 1:1 had no observable absorption peaks. UV visible spectra confirmed chemical reduction resulting to formation of NPs while TEM images depicted core-shell arrangement in the Ag-Pt NPs 1:1 with particle size of 20 nm. Monometallic Ag and Pt NPs reported particle sizes of 60 nm and 2.5 nm respectively. The particle size distribution in the BM NPs was found to directly depend on the concentration of Pt NPs around the Ag core. EDX elemental composition analysis of the nanoparticle suspensions confirmed presence of the Ag and Pt in the Ag-Pt NPs 1:1. All the spectroscopic analysis confirmed the successful formation of the nanoparticles.

Keywords : kinetics, morphology, nanoparticles, platinum, silver

Conference Title : ICNB 2015 : International Conference on Nanotechnology and Biotechnology

Conference Location : Melbourne, Australia

Conference Dates : December 13-14, 2015