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## X-ray diffraction and band gap studies of bimetallic silver-platinum nanoparticles

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Core shell bimetallic nanoparticles of Ag-Pt of varying ratios (1:1, 1:3 and 3:1) band gaps were studied using UV-visible spectroscopy (UV) and cyclic voltammetry (CV) and further characterized using X-ray diffraction (XRD) technique. Tauc's model was employed for optical band gap studies typical of direct band gaps while electrochemical band gap was investigated under CV based on Breda's equation. Band gap of nanoparticles were found in the range of 3.55 eV to 4.02 eV for optical and 1.45 eV to 1.80 eV for electrochemical measurements. The expansion in each case could be attributed to quantum size effect. Band gap increase in the bimetallic nanoparticles ratios was consistent in both electrochemical and optical results relative to monometallics. The fact that electrochemical band gaps were found to be smaller than the optical band gaps with an average factor difference above 1 was attributed to solvation and electrode surface coverage effects. These band gap values suggest better electroactivity of the nanoparticles. Although the electrochemically determined band gaps were found to be lower than the optical band gap, in most cases values portrayed similar trends. These results depict nanoparticles with band gaps within semiconductor range for most materials. XRD patterns depicted crystallinity in all the synthesized NPs with confirmation of the face centred cubic structure. Comparison of transmission electron microscope (TEM) data showed that the band gaps were nanoparticle size-dependent with an inverse relationship observed and this was attributed to the quantum confinement effect.

### Biography

Fredrick Okumu is a 31 years old doctoral student at Cape Peninsula University of Technology (CPUT), faculty of applied science and has recently submitted his PhD thesis for examination. He is currently working as student support staff at CPUT as a retention officer. He has published 6 papers in reputed journals.

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