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# Graphene & 2D Materials

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## Phytosynthesis of Ag, Au and Ag-Au bimetallic nanoparticles using golden rod (*Solidago canadensis*) plant and their cytotoxicity

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Silver, Gold and Silver-Gold bimetallic (BNP) NPs were synthesized by use of golden rod leaf extracts. Precursors, HAuCl<sub>4</sub>·xH<sub>2</sub>O and AgNO<sub>3</sub> were mixed individually or jointly with aqueous extract of golden rod leaf and heated with stirring for 1 h. There were periodic changes in color which indicate the formation of nanoparticles, and were confirmed by use of UV-vis spectroscopy. Sizes of NPs were determined by X-ray diffraction (XRD) and transmission electron microscopy (TEM) while bio-reductants were examined using Fourier transform infrared spectroscopy (FTIR). In BNPs, both Au and Ag were detected in NPs (NP). This observation reinforces the assertion that plant biomolecules can suppress oxidation of Ag by Au and is the key in forming Ag-Au alloy structures instead of hollow Au shells or core shells. Formation of Ag, Au and alloy Ag-Au bimetallic NPs were suggested by appearance of bands at 420, 560 and 530 nm, respectively. Sizes and shapes of Ag-Au BNP resemble pure AuNPs more than they do AgNPs. Electrochemical characterization of NPs by use of cyclic voltammetry showed that Ag-Au alloy BNPs were more electroactive compared to other electrodes. Cytotoxicity of NPs on H4IIE-luc, rat hepatoma cells and HuTu-80 intestinal cells were determined by use of xCELLigence. The greatest concentrations of Ag and Ag-Au bimetallic were toxic to both HuTu-80 and H4IIE-luc cells, while BNPs exhibited the greatest toxic potency to these two types of cells. Since AuNPs caused no toxicity. The Au functional portion of the material could be assisting in uptake of particles across the cell membrane.

### Biography

Dr Elias E Elemike is a postdoctoral fellow at North West University Mafikeng campus South Africa. He has synthesized a lot of nanoparticles using different plant extracts with special applications as antimicrobial agents and verified their nanotoxicity. He has presented papers in both local and international conferences where he has met collaborators which he is currently working with. He is of the view that the solution to most dreadful diseases is bio nanotechnology.

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