ABSTRACT

Bismuth oxide-modified gold nanoparticles were successfully produced synthesized using the Nd:YAG pulsed laser ablation method (1064 nm, 80 mJ, 7 ns, 10 Hz). The bismuth oxide concentration was varied at 0.5 mM and 1 mM, with the addition of polyethylene glycol (PEG) as a stabilizer, while gold nanoparticles in distilled water were used as a control sample and iodine as a conventional contrast agent for comparison. The results showed the formation of a stable nanoparticle colloid with color intensity becoming darker as the bismuth concentration increased. UV-Vis characterization revealed a shift in the Surface Plasmon Resonance (SPR) peak toward longer wavelengths following the addition of bismuth. XRD analysis confirmed the presence of crystalline phases of gold and bismuth, as well as peak shifting resulting from modifications due to the interaction between Au and Bi, while TEM characterization revealed round (spherical) nanoparticles with a relatively uniform size distribution. The results of in vitro evaluation tests as a contrast agent showed that Bi_2O_3-modified Au nanoparticles produced higher CT-Number (HU) and Contrast-to-Noise Ratio (CNR) values compared to gold nanoparticles without Bi_2O_3 and iodine contrast agents across all tube voltage variations tested. The Au-Bi_2O_3/PEG sample with a bismuth concentration of 1 mM provided the best performance as a contrast agent because it produced the highest CT-Number and CNR values. The results of this study indicate that bismuth oxide-modified gold nanoparticles are capable of enhancing X-ray attenuation, thus holding potential for development as an alternative contrast agent for CT-scan.

***Keywords**: Gold nanoparticles, bismuth oxide, pulsed laser ablation, CT-Scan contrast agent, CT-Number, contrast-to-noise ratio.*