

ABSTRACT

A Computed Tomography Scan (CT scan) is able to produce detailed cross-sectional images of the body but has limitations in distinguishing tissues that have adjacent densities, so a contrast agent is needed. Contrast agents can increase the contrast in the image so that tissues that have adjacent densities can be distinguished. This study aims to synthesize molybdenum oxide nanoparticles in an alginate solution medium with varying concentrations using the pulse laser ablation method with a Nd:YAG laser (1064 nm, 80 mJ, 7 ns, 10 Hz) and analyze the resulting molybdenum oxide nanoparticles as a contrast agent in a CT scan. The synthesis process carried out for 3 hours produced yellow molybdenum oxide nanoparticle colloids. Characterization of MoOx nanoparticle colloids using UV-Vis, XRD, FTIR, and TEM. The characterization results showed that the formation of molybdenum oxide nanoparticles was successful with a spherical shape with a distribution size of 13.53 nm, indicating the identified crystalline phase of molybdenum oxide (MoO₂ and MoO₃), the presence of molybdenum oxide functional groups (Mo-O, Mo-O-Mo, and Mo=O), and carboxylate groups (COO⁻), with a spectrum peak of 293 nm indicating the presence of molybdenum oxide. MoOx colloids were then applied as contrast agents for in vitro imaging using a CT scan. The imaging results showed that MoOx nanoparticles in alginate with various concentration variations were able to increase the HU value at all variations of tube voltage compared to iodine. The calculation of the contrast to noise ratio (CNR) stated that molybdenum oxide nanoparticles with a 0.2% concentration in an alginate solution medium showed superior values compared to iodine. This shows that molybdenum oxide nanoparticles in an alginate medium with a concentration of 0.2% have potential as an alternative contrast agent for CT scans with excellent dispersion stability and effective image contrast enhancement capabilities.

Keywords: Molybdenum oxide nanoparticles, pulsed laser ablation, CT-Scan contrast agent, CT-number, contrast to noise ratio.