

ABSTRACT

The synthesis of zirconium dioxide nanoparticles in an alginate aqueous medium at varying concentrations using the pulsed laser ablation method with an Nd:YAG laser (1064 nm, 80 mJ, 7 ns, 10 Hz) was successfully carried out. Distilled water was used as the control medium. The synthesis process, conducted over 3 hours, produced spherical zirconium dioxide nanoparticle colloids evenly dispersed in the alginate medium. Both zirconium dioxide nanoparticle colloids exhibited a cloudy white color. The zirconium dioxide nanoparticle colloids were then applied as a contrast agent for in vitro imaging using computed tomography (CT) scans. The results of the study showed that zirconium dioxide nanoparticles in an alginate medium with varying concentrations produced superior CT-Number values at all tested CT-Scan tube voltages compared to zirconium nanoparticles in distilled water and iodine contrast agents. CT-Scan test results showed that the zirconium dioxide sample with a 0.2% alginate concentration produced the highest HU and CNR values compared to the other samples. The highest CNR value was obtained at 80 kV indicating that photoelectric interactions at low energy can enhance the X-ray attenuation capability of zirconium dioxide nanoparticles. Based on the research results, it can be concluded that zirconium dioxide nanoparticles were successfully synthesized using the pulsed laser ablation method in an alginate liquid medium and demonstrated.

Keywords: *Zirconium dioxide nanoparticles, Pulsed laser ablation, Contrast agent, CT scan, CT number, Contrast to noise ratio (CNR).*