ABSTRACT

Metal nanoparticles are currently being widely developed as antibacterial agents due to their small particle size and large surface area, which allow them to interact more effectively with bacterial cell membranes. However, metal nanoparticles have drawbacks, as they are easily oxidized and tend to agglomerate during synthesis, which can reduce their stability and antibacterial effectiveness. This study aims to synthesize and characterize CuZn (brass) nanoparticles using the pulsed Nd:YAG laser ablation method with two types of liquid media, 0.1% polyvinylpyrrolidone (PVP) and distilled water, and to evaluate their antibacterial activity against Escherichia coli. Characterization was carried out using FESEM to determine particle morphology and size, UV-Vis spectroscopy to observe the Surface Plasmon Resonance (SPR) phenomenon, and FTIR to identify functional groups interacting with the nanoparticle surface. FESEM results showed that the PVP medium produced CuZn nanoparticles with smaller sizes (±26–34 nm), more uniform morphology, and lower agglomeration compared to those synthesized in distilled water (±34–42 nm). The UV-Vis spectra revealed an SPR peak at wavelengths of 569 nm in PVP medium and 593 nm in aquades. FTIR analysis showed characteristic absorption bands of C=O and C–N groups from PVP interacting with the CuZn surface, acting as stabilizing agents that prevent particle agglomeration. The antibacterial activity test using the disc diffusion method demonstrated that CuZn nanoparticles synthesized in PVP exhibited higher inhibition against E. coli (IDH = 2.2) compared to those synthesized in distilled water (IDH = 1.7). Thus, the use of PVP proved effective in producing smaller, more stable CuZn nanoparticles with enhanced antibacterial activity.

Keyword : CuZn, *nanoparticles*, PVP, *laser ablation*, *antibacterial*