

Effect of seaweed *Kappaphycus alvarezii* in the synthesis of Cu@Cu₂O core-shell nanoparticles prepared by chemical reduction method

ABSTRACT

This study aims to investigate the influence of different concentrations of *Kappaphycus alvarezii* (*K. alvarezii*) for the synthesis of Cu@Cu₂O core-shell nanoparticles (NPs) in aqueous solution. The core-shell NPs were prepared by a chemical reduction method using *K. alvarezii*, CuSO₄·5H₂O, NaOH, ascorbic acid, hydrazinium hydroxide, as stabilizer, copper precursor, pH moderator, antioxidant and reducing agent under 120°C temperature, respectively. Formation of Cu@Cu₂O-NPs was determined by UV-Vis spectroscopy where surface plasmon absorption maxima can be observed at 390-590 nm. The synthesized core-shell NPs were also characterized by X-ray diffraction. Moreover, the morphology and structure of the *K. alvarezii*/Cu@Cu₂O-NPs were investigated by TEM, FESEM and EDXRF. The Fourier transform infrared spectrum suggested the complexation present between *K. alvarezii* and Cu@Cu₂O-NPs. The study clearly showed that using various amounts of *K. alvarezii* leads to produce different ratios and sizes of Cu@Cu₂O NPs. The size of the Cu@Cu₂O-NPs decreased as the amount of *K. alvarezii* was increased. The ratio of Cu@Cu₂O increases with the increasing concentration of *K. alvarezii* until 0.2 wt%.

Keyword: Copper nanoparticle; Core-shell nanoparticles; *Kappaphycus alvarezii*; Seaweed; X-ray diffraction