Abstract

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Green synthesis of copper oxide nanoparticles using Macrocystis pyrifera free-biomass extract

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Abstract

The need to carry out research focused on novel ecological protocols has increased exponentially, motivated by the common aim to reduce toxic by-products drawback from chemical and physical methods. Amongst different living organisms studied as potential candidates for the synthesis of metallic nanoparticles, algae biomass is presented as a novel and easy-to-handle. We evaluate the influence of reaction parameters in the synthesis of copper nanoparticles (Cu-NPs) using Macrocystis pyrifera free-biomass non-boiled (FBNB) extract. Response surface methodology (RSM) based on a central composite design (CCD) was used to evaluate the following independent variables for nanoparticle formation in the extract: X1: CuSO4 concentration; X2: pH; and X3: temperature. Their effects were assessed on synthesized Cu-NP average size distribution, zeta potential, and polydispersity index (PDI) by dynamic light scattering (DLS). Shape, size, and elemental mapping at a microstructural level were measured by scanning electron microscopy (SEM) with energy dispersive X-ray spectrometry (EDS). Results from CCD showed that predicted optimal reaction conditions for Cu-NP formation using M. pyrifera extract were 2.2 mM CuSO4 concentration, pH 8, and incubation at 25,5°C, obtaining an average size distribution, Z potential and PDI of 121 nm, -23.5 mV and 0.3, respectively. This work demonstrated that M. pyrifera extract is a feasible biomass for the synthesis of Cu-NPs and that the control of the reaction parameters can determine the nanoparticle characteristics.

Biography

I am a proactive Bachelor of Biotechnology (Honor's), with relevant experience in biology, bio nanotechnology, cell culture, microbiology, bioinformatics, molecular biology and genomics. Currently developing as an integral scientist to generate impact research, always willing to learn and improve. I am currently leading CRISPR/Cas-based bio monitoring project.