Simulation and modeling of synthesis Cu nanoparticles in sodium alginate media by means of expert systems

ABSTRACT

This research was to apply the combination of the particle swarm optimization method and artificial neural network training with the aim of building a quantitative model to forecast the size of copper nanoparticles (Cu-NPs) prepared in sodium alginate. Sodium alginate, sodium hydroxide, copper sulfate, hydrazinium hydroxide, and ascorbic acid were used as stabilizer, pH moderator, copper precursor, reducing agent, and antioxidant, respectively. The results showed that the different sizes of Cu-NPs were obtained by changing these functions. Meaning that by increasing the amount of sodium alginate and or increase the volume of hydrazine hydrate, particle sizes of Cu-NPs were reduced. Other variables had the opposite effects due to the increase of the size of the Cu-NPs. The prediction results were remarkably in agreement with the experimental data with a correlation coefficient of 0.99 and a mean square error of 0.0058.

Keyword: Artificial neural network; Copper nanoparticles; Particle swarm optimization; Sodium alginate