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A predictive model on size of silver nanoparticles prepared by green synthesis method using hybrid artificial neural network- particle swarm optimization algorithm

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Abstract

The aim of this study is green synthesis of Ag nanoparticles (Ag NPs) and optimization of practical process by artificial neural network to prepare the minimum size of Ag. To decrease the issues of trapping in local minima, heuristic optimization methods, i.e., the particles swarm optimization (PSO) and modified PSO, were applied as training strategy for feed forward Neural Networks. To collect the experimental data, design of experiment with factorial D-optimal array was employed. Uv-visible, X-ray diffraction and field emission scanning electron microscopy were used to characterize the prepared samples. The results confirmed the possibility of Ag NPs preparation with the size about 4nm at optimum condition. Based on the results of the optimal network sensitivity analysis it was found that the feed rate, $AgNO_3$ to opium ratio and agitation speed have the greatest impact on the particle size of the final product, respectively.

Keywords: Silver nanoparticle; Modified Particle Swarm Optimization; Artificial Neural Network; Green Synthesis; Opium Syrup

1. Introduction

Recently, nanomaterial's have exponentially grown usages in various aspects of food industries,