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ANN modeling for scale-up of green synthesis of iron oxide nanoparticle and its application for decolorization of dye effluent

K. Sathya[a], R. Saravanathamizhan[a,*], G. Baskar[b]

[a]*Department of Chemical Engineering, A.C. Tech., Anna University, Chennai 600025, India, Tel. +91 44 22359237; email: thamizhan79@rediffmail.com (R. Saravanathamizhan), Tel. +91 44 22359237, email: satyakarunakaran@gmail.com (K. Sathya)*
[b]*Department of Bio Technology, St. Joseph's College of Engineering, Chennai 600119, India, Tel. +91 9443678571; email: basg2004@gmail.com (G. Baskar)*

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ABSTRACT

Nanomaterials are synthesized in the laboratory scale and converting it to industrial scale is still a challenge. In this work, green synthesis of iron oxide nanoparticle has been carried out using *Coriandrum sativum* leaf extract as a reducing agent, and the experimental operating parameters such as time, temperature, ferric chloride concentration, and stirring speed for the yield of nanoparticles were optimized. Using this laboratory data, an artificial neural network (ANN) model has been used to determine the yield of iron oxide nanoparticle. It is observed from this work that ANN model is a useful tool to scale up the production of iron oxide nanoparticle from lab-scale to industrial-scale application. The neural network configuration of one hidden layer with six neurons (4-6-1) matches well with the experimental values. Further the photocatalytic decolorization of direct red dye wastewater has been reported using the green-synthesized iron oxide nanoparticle. The iron oxide nanoparticle showed maximum decolorization efficiency of 87% at 10 mg L^{-1} concentration of direct red dye.

Keywords: Artificial neural network model; *Coriandrum sativum* leaf extract; Green synthesis; Iron oxide nanoparticle; Decolorization

* Corresponding author.

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