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Modeling for electrical impedance spectroscopy of (4E)-2-amino-3-cyanobenzo[b]oxocin-6-one by artificial neural network

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Abstract

The efficiency of artificial neural networks (ANNs) for modeling the electrical impedance spectroscopy of (4E)-2-amino-3-cyanobenzo[b]oxocin-6-one was investigated. The experimental data for electrical impedance and dissipation factor were used as input data for the model. The optimum network structure was obtained by testing different numbers of neurons with altered transfer functions to normalize the data. This structure simulated the experimental data with a very high accuracy and predicted new values that were untested experimentally. A nonlinear equation indicates the relation between inputs and output was introduced based on ANN model. The performances of the optimum network are obtained. Finally, this study showed that neural networks are a very effective tool in modeling and are able to follow the patterns of the experimental data with a high precision.

Keywords: Artificial neural network; Modeling; Organic compound; Impedance.

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1. Introduction

Electrical impedance spectroscopy measurements give ability to recognize the dielectric and electric properties of the materials [1, 2]. Vast studies have been carried out to investigate the conduction behavior in organic materials. Organic materials are attracting a significant attention because they acquire considerable optical sensitivities, high optical thresholds for laser power [3]. Also, they are convenient for solar cell enhancement [4].

Artificial neural network (ANN) model has a notable ability of attaining relations from complex or imprecise data. This ability can be used for extracting patterns and detecting trends that are complicated for computer systems to understand. It is configured for modeling through a learning process. Neural networks have the ability to generalize and associate data after successful training. A neural network can present solutions for similar problems of the same class that is valuable for pattern recognition systems. Additionally, it deals with nonlinear problems. ANN has an
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