Abstract

Comparative Evaluation of Artificial Neural Networks and Data Analysis in Predicting Liposomes' Size in a Periodic Disturbance Micromixer [†]

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Abstract: Artificial Neural Networks (ANN) and Data analysis are powerful tools used for supporting decision-making. They have been employed in diverse fields and one of them is nanotechnology used, for example, in predicting particles size. Liposomes are nanoparticles used in different biomedical applications that can be produced in Dean Forces-based Periodic Disturbance Micromixers (PDM). In this work, ANN and data analysis techniques are used to build a liposome size prediction model by using the most relevant variables in a PDM, i.e., Flow Rate Radio (FRR) and Total Flow Rate (TFR). The ANN was designed in MATLAB and fed data from 60 experiments, which were 70% training, 15% validation and 15% testing. For data analysis, regression analysis was used. The model was evaluated; it showed 98.147% of regression number for training and 97.247% in total data compared with 78.89% regression number obtained by data analysis. These results demonstrate that liposomes' size can be better predicted by ANN with just FRR and TFR as inputs, compared with data analysis techniques when the temperature, solvents, and concentrations are kept constant.

Keywords: artificial neural network; data analysis; prediction model; liposomes; Periodic Disturbance Micromixers

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