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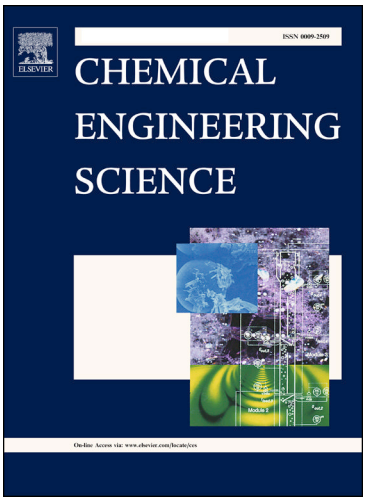

Non-spherical solid-non-Newtonian liquid fluidization and ANN modelling: minimum fluidization velocity

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Non-spherical solid-non-Newtonian liquid fluidization and ANN modelling: minimum fluidization velocity

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ABSTRACT

Experiments have been carried out to determine the minimum fluidization velocity for sand particles of irregular shape and size using pseudoplastic liquids in different Perspex columns. The effect of different operating parameters, like column diameter, particle size and shape, rheological properties of the liquid on minimum fluidization velocity has been investigated. It has been observed that as sphericity of the particle decreases, minimum fluidization also decreases. Empirical correlation has been developed to predict the minimum fluidization velocity as a function of physical and dynamic variable of the system. Statistical analysis of the correlation suggests that is of acceptable accuracy. Applicability of the artificial neural network modelling using gradient descent and Levenberg-Marquardt algorithm have also been successfully tested.

Keywords: minimum fluidization velocity, non-Newtonian liquid, sphericity, Levenberg-Marquardt algorithm

1. Introduction

Liquid fluidization is used in food processing, hydrometallurgy, biochemical processing, water treatment etc. The unit operations that utilize the fluidization technology are coal combustion, cracking, reforming in refinery, Fisher Tropsch synthesis, gasification, coking etc. The advantages of this technique is the ability to perform number of unit operation like heat and mass transfer, leaching, drying, mixing, segregation, granulating etc. When liquid is passed

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