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A Grey Wolf Optimizer-Based Fractional Calculus in Studies on Drying

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ABSTRACT

The aim of this work is to test the faisability of applying the fractionnal calculus modeling in the field of chemical engineeing. In this paper, a comparative study has been conducted between analytical and fractional solution of the Fick's first and second-order of diffusion to model the drying process of different products and dryers and under different operational parameters. Laplace and Laplace's inverse transform have been used to obtain the solution in function with two parameters: the order index n and the fractional time index α of the above Fick's law and theirs parameters have been non-linearly optimized using a grey wolf optimization (GWO) algorithm. The results showed that the anomalous diffusion phenomenon during the drying process is best described by the fractional- order model. Values obtained using best model were in better agreement with the experimental data than the values obtained using the other selected models with very acceptable statistical parameters.

Keywords: Activation energy; grey wolf optimization; modeling; moisture ratio