Thin-Layer Drying Characteristics and Modelling of Instant Coffee Solution

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Abstract : The thin-layer drying characteristics of instant coffee solution were investigated in a laboratory tunnel dryer. Drying experiments were carried out at three temperatures (80, 100 and 120 °C) and an air velocity of 1.2 m/s. Drying experimental data obtained are fitted to six (6) thin-layer drying models using the non-linear least squares regression analysis. The acceptability of the thin-layer drying model has been based on a value of the correlation coefficient that should be close to one, and low values for root mean square error (RMSE) and chi-square (x^2). According to this evaluation, the most suitable model for describing drying process of thin-layer instant coffee solution is the Page model. Further, the effective moisture diffusivity and the activation energy were computed employing the drying experimental data. The effective moisture diffusivity values varied from 1.6133×10^{-9} to 1.6224×10^{-9} m²/s over the temperature range studied and the activation energy was estimated to be 162.62 J/mol.

Keywords : activation energy, diffusivity, instant coffee, thin-layer models
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