Abstract

The paper describes paddy grain (rice) drying in a pneumatic conveyor where gas–particle heat and mass transfer occur simultaneously with transporting and drying operations. A one-dimensional macroscopic drying model of the overall bed incorporating mass and energy balances and drying kinetics of moisture diffusion inside the paddy grain is developed. The set of coupled non-linear ordinary differential equations is solved numerically to illustrate the evolution of moisture and temperature of the paddy grain and air stream throughout the dryer length. The effect of specific airflow rate, which depends on dryer diameter, paddy feed rate and inlet-air velocity on the final moisture content, and temperature of paddy grain and air stream is studied. The feasibility of paddy drying in a pneumatic conveyor is evaluated using the developed model. This device is found impractical for drying of hygroscopic material such as paddy grain because of the low solid residence time for dryers of reasonable size.