Abstract

The objective of this work is to contribute to the enhancement of sludge of wastewater treatment plants and solar energy in Algeria. A kinetic comparison was made to the direct and indirect solar dryers operated with natural convection. Two models have been developed to simulate drying. Under natural conditions and at ambient temperatures below 32 °C, the indirect dryer gives high temperatures and efficiency compared to the direct dryer. Drying curves show that the higher the temperature is, the shorter drying time is and the faster drying speed is. From the drying curves, only the decreasing speed phase or slowdown (phase 2) is observed in the two types of drying, which is similar to results obtained in the literature with plant products. Solar dryers have reduced the time needed, a moisture reduction of 71% which increases the dryness of the mud from 14.47% to 85.53%. Thirteen mathematical models existing in the literature were tested and compared with the proposed models. The proposed models and the modified Henderson and Pabis model showed the best smoothing qualities of all indirect and direct dryer drying kinetics, with an advantage for the proposed models as they are dimensionless (independent models of units of measurement), they contain fewer parameters and verify the boundary conditions.