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Modelling of drying processes of pharmaceutical granules

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Tablets are conventionally produced via consecutive batch process steps. Recent introduction of continuous process equipment is gaining industrial importance in pharmaceutics. Transition to continuous production requires improved understanding of all operations, necessitating the development of mechanistic models of multi-phase systems which in the end allow process control. This contribution focuses on continuous fluidized bed drying of pharmaceutical wet granules. A step-wise approach is used in model development, starting with the drying behaviour of single granules. Experiments to determine the drying characteristics were conducted in a continuous fluidized bed dryer at several gas temperatures and velocities. The drying process was found to consist of two subsequent phases: a fast drop in moisture content followed by a slower evaporation. A mechanistic model for single granules [1] yielded good description of the data, and was calibrated and validated. The conceptual model consists of a liquid evaporation model (fast part) and a wet core - dry crust model describing the decrease of the wet core diameter and thus the moisture content (slower part). Resulting distinction between weakly and strongly bonded water in the granules yields deeper knowledge of the process. The validated model can now be used for optimization of the continuous drying process.

[1] M. Mezhericher, A. Levy, and I. Borde, “Theoretical Drying Model of Single Droplets Containing Insoluble or Dissolved Solids,” *Dry. Technol.*, vol. 25, Jun. 2007, pp. 1025-1032.