Research paper

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Transparent Predictive Modelling of the Twin Screw Granulation Process using a Compensated Interval Type-2 Fuzzy System

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Abstract

In this research, a new systematic modelling framework which uses machine learning for describing the granulation process is presented. First, an interval type-2 fuzzy model is elicited in order to predict the properties of the granules produced by twin screw granulation (TSG) in the pharmaceutical industry. Second, a Gaussian mixture model (GMM) is integrated in the framework in order to characterize the error residuals emanating from the fuzzy model. This is done to refine the model by taking into account uncertainties and/or any other unmodelled behaviour, stochastic or otherwise. All proposed modelling algorithms were validated via a series of Laboratory-scale experiments. The size of the granules produced by TSG was successfully predicted, where most of the predictions fit within a 95% confidence interval.

Keywords: Twin screw granulation; Interval type-2 fuzzy logic system; Gaussian mixture model.

1. Introduction

Granulation processes are, more often than not, used to obtain and maintain good specific properties in terms of compressibility, flowability and homogeneity (Iveson, 2001).