

# Accepted Manuscript

Research paper

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

Wafa' H. AlAlaween, Bilal Khorsheed, Mahdi Mahfouf, Ian Gabbott, Gavin K. Reynolds, Agba D. Salman

PII: S0939-6411(17)31102-5  
DOI: <https://doi.org/10.1016/j.ejpb.2017.12.015>  
Reference: EJPB 12655

To appear in: *European Journal of Pharmaceutics and Biopharmaceutics*

Received Date: 25 September 2017  
Revised Date: 22 November 2017  
Accepted Date: 27 December 2017

Please cite this article as: W.H. AlAlaween, B. Khorsheed, M. Mahfouf, I. Gabbott, G.K. Reynolds, A.D. Salman, Transparent Predictive Modelling of the Twin Screw Granulation Process using a Compensated Interval Type-2 Fuzzy System, *European Journal of Pharmaceutics and Biopharmaceutics* (2017), doi: <https://doi.org/10.1016/j.ejpb.2017.12.015>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



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

Wafa' H. AlAlaween<sup>a\*</sup>, Bilal Khorsheed<sup>b</sup>, Mahdi Mahfouf<sup>a</sup>, Ian Gabbott<sup>c</sup>, Gavin K. Reynolds<sup>c</sup> and Agba D. Salman<sup>b</sup>

<sup>a</sup>*Department of Automatic Control and Systems Engineering, The University of Sheffield, UK*

<sup>b</sup>*Department of Chemical and Biological Engineering, The University of Sheffield, UK*

<sup>c</sup>*Pharmaceutical Technology & Development, AstraZeneca, UK*

(E-mail\*: whalalaween1@sheffield.ac.uk)

## 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).

Download English Version:

<https://daneshyari.com/en/article/8412188>

Download Persian Version:

<https://daneshyari.com/article/8412188>

[Daneshyari.com](https://daneshyari.com)