

## Accepted Manuscript

Detection and estimation of capillary interparticle forces in the material of a fluidized bed reactor at high temperature by powder flow characterization

Roberto Chirone, Diego Barletta, Massimo Poletto, Paola Lettieri



PII: S0032-5910(18)30145-1  
DOI: doi:[10.1016/j.powtec.2018.02.024](https://doi.org/10.1016/j.powtec.2018.02.024)  
Reference: PTEC 13200  
To appear in: *Powder Technology*  
Received date: 24 September 2017  
Revised date: 10 January 2018  
Accepted date: 9 February 2018

Please cite this article as: Roberto Chirone, Diego Barletta, Massimo Poletto, Paola Lettieri , Detection and estimation of capillary interparticle forces in the material of a fluidized bed reactor at high temperature by powder flow characterization. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Ptec(2017), doi:[10.1016/j.powtec.2018.02.024](https://doi.org/10.1016/j.powtec.2018.02.024)

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.

# DETECTION AND ESTIMATION OF CAPILLARY INTERPARTICLE FORCES IN THE MATERIAL OF A FLUIDIZED BED REACTOR AT HIGH TEMPERATURE BY POWDER FLOW CHARACTERIZATION

**R. Chirone<sup>1</sup>, D. Barletta<sup>2</sup>, M. Poletto<sup>2</sup> and P. Lettieri<sup>1</sup>**

<sup>1</sup> Department of Chemical Engineering, University College London, London, WC1E 7JE, UK

<sup>2</sup> Dipartimento di Ingegneria Industriale, Università degli Studi di Salerno, Via Giovanni Paolo II, 132-I-84084 Fisciano (SA), Italy

## Abstract

Two ceramic powder samples having different compositions of surface impurities and particle size distributions were considered. These two samples resulted from a high temperature fluidized bed reactor which in its operation showed changes of working condition that might be attributed to the onset of strong interparticle forces. The flow behaviour of these powders was characterized by the High Temperature Annular Shear Cell (HT-ASC), between ambient temperature and 500 °C. Furthermore, a model is developed to relate the change of the powder flowability to the formation of a liquid phase due to the melting of particle impurities present on the particle surface. In particular, the model is used to predict, on the base of the salt composition, the intensity of the interparticle forces at different temperatures. The interparticle forces predicted by the model can be compared with those that can be inferred from the powder flow properties measured with the HT-ASC. Therefore, it is demonstrated that it is possible to derive a theoretical model to predict interparticle forces in a particulate material relevant to fluidized bed reactor, on the basis of the impurities composition. Furthermore, it is demonstrated the possibility to correctly estimate the intensity of average interparticle forces in the same kind of material by the interpretations of bulk flow properties measured with a shear tester, even in the case in which capillary forces take the place of the much weaker van der Waals forces. More in general, the paper suggests a method by which powder rheology can be used to indirectly evaluate the effects of the interparticle forces on fluidization processes even in case in which strong capillary interaction occur.

Download English Version:

<https://daneshyari.com/en/article/6675139>

Download Persian Version:

<https://daneshyari.com/article/6675139>

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