Product & Process Engineering **March 2021**

M.Sc Thesis Project:

Investigating agglomeration of fine powders in assisted fluidization

Nature of the work: Experimental/Theoretical study

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Motivation and Background

Gas-solid fluidization is one of the most broadly used techniques in the industry, where homogenous mixing and vigorous interphase contacts are of primary interest. Fine powders (from nano to a few microns) of a large surface area are typically good candidates for catalytic materials, but their fluidization is often problematic, very hard to achieve. At this scale, interparticle forces, such as capillary force and van der Waals force play a significant role, making these powders cohesive and tend to agglomerate (Fig. 1). As a result, mitigating agglomeration is, obviously, a key step to improve the fluidization performance of fine powders.

Research project

This project aims to investigate agglomerates size obtained from fluidizing fine powders under different operating conditions (e.g., implementing mechanical vibrations or gas pulsations). Different size measurement methods, such as sieve analysis, analysis based on microscopic image, settling tube technique and so forth, will be studied and compared to evaluate deviations induced and select the most reliable approach(s). Based on these experimental measurements, existing mathematical models to predict agglomeration will be reviewed and improved.

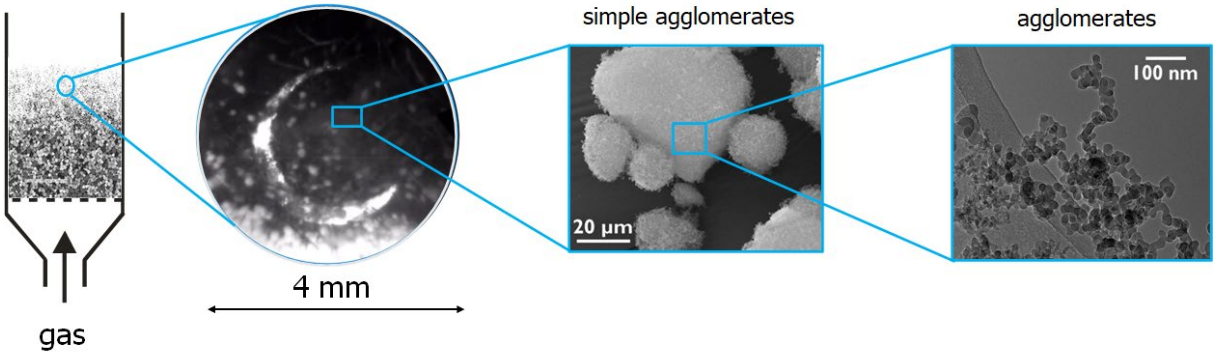

Figure 1: Agglomerates of fine pwoders in fluidized beds

References:

1. Yao et al., Powder Technol 124 (2002) 152
2. van Ommen et al., J Nanoparticle Res 14 (2012) 737
3. De Martín et al., Langmuir 30 (2014) 12696

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