# MORPHOLOGICAL CHARACTERIZATION OF SPRAY FLUIDIZED BED AGGLOMERATES BY USING X-RAY µ-COMPUTER TOMOGRAPHY

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## ABSTRACT

Macroscopic features of agglomerates such as flowability, strength, and stability, are directly influenced by microscopic features like micro-structure, size and shape. In order to enhance and control properties of aggregates, it is essential to make a link between the desired performance of the final product and operating conditions. In the present study methods for the morphological evaluation of the micro-structure of granules will be presented, in order to correlate process parameters with the properties of real products.

Aggregates were produced in spray fluidized bed, using different primary materials, porous γ-$Al_2O_3$ and non porous glass beads, with HPMC (Hydroxypropylmethylcellulose) as the binder and altering inlet air temperature and binder concentration, which are key process parameters and critical for the process result. The three dimensional micro-structure was analyzed by means of X-ray µ-computer tomography (µ-CT).

By performing sequences of image processing operations on volume images of agglomerates obtained from scanning in µ-CT, matrices numbering every primary particle in the considered agglomerate and storing the coordination position of its center, its radius and its volume were created. Based on this data, additional codes were developed to analyze particle positions in space and investigate the following morphological descriptors: radius of gyration, porosity, fractal dimension and pre-factor, coordination number distribution, radial distribution of particle position and porosity, and distributions of angles connecting every primary particle to its associated neighbors. By image analysis from volume image of agglomerate, binder was distinguished from the primary particles. Thus, local distribution of droplets on the particle surface and the true internal morphology of the agglomerate could be analyzed as well. Finally, binder thickness and void size distribution were calculated for agglomerates with different numbers of primary particles.

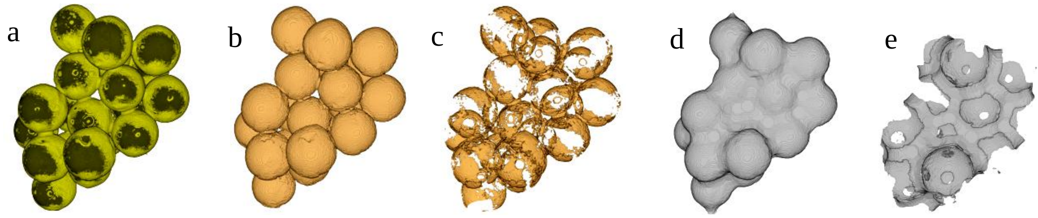


Figure 1- Agglomerate consisting of 21 primary particles. (a) Whole agglomerate containing primary particles and binder, (b) primary particles, (c) binder, (d) structure after performing closing, (e) matrix structure of internal voids.