

MORPHOLOGICAL CHARACTERIZATION OF COMPACT AGGREGATES USING IMAGE ANALYSIS AND A GEOMETRICAL STOCHASTIC 3D MODEL

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Abstract. The 3D morphological characteristics of size and shape of latex nanoparticle aggregates have a major impact on the quality of these powders and their performances such as flowability/processability in an industrial context. Most of the time the morphological characterization of these aggregates is only possible from the analysis of projected images, which only allows to measure 2D features. In this paper, a method for the 3D morphological characterization of a compact aggregate from the analysis of a single image is proposed. This method is composed of three steps: the description of a stochastic geometric model, the acquisition of data from image analysis, and the fitting of the model parameters to the data using an optimization process. The method was validated using images of a calibrated 3D printed aggregate, and the results presented in the last section show discrepancies lower than 1% for 2D morphological characteristics and lower than 2% in most cases for 3D characteristics. The limitations of the model are discussed and suggestions for improvement are made in the conclusion.

Keywords. Aggregates, Digital twins, Geometric modeling, Image analysis, Stochastic geometry