

Mathematical and Numerical Challenges in Particle Technology

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Aggregation is an important particle size enlargement process in many chemical, process and pharmaceutical industries. The other desired or undesired process is the fragmentation of particles due to high impact collisions. The dynamics of the process by which particles undergo changes in its physical properties are modelled by an integro-partial differential equation known as the *population balance equation*.

The first part of the talk will be devoted to the well-posedness of the problem by analysing the existence, uniqueness of the solutions of the population balance equation using sequential convergence results. Furthermore, an efficient and accurate discretization method based on a finite volume approach for solving population balance equation will be presented. The principal of the method lies in the introduction of an extra feature that is beyond the essential requirement of mass conservation. The extra feature controls more precisely the behavior of a chosen integral property of the particle size distribution that does not remain constant like mass, but changes with time. The new scheme is validated by comparing its results with an existing method against several test cases. Finally, some applications of the population balance models are simulated.