Numerical Coating Simulations at Industrial Scale using Non-spherical Bi-convex Objects

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Tablet coating in drum coaters is a widely used unit operation in the pharmaceutical industry. Whilst this process, a liquid suspension is sprayed onto a moving bed of tablet cores. Supported by hot air flow throughout the perforated drum, the solvent evaporates. The remaining suspension dries and forms a coating layer on the tablet cores.

In the case of active coating, the coating containes an active pharmaceutical ingredient (API). That's why the remaining coating mass on individual tablets is the critical parameter. The so called inter-tablet coating variability must meet the regulatory guidelines.

Numerical simulations can assist for the proper selection of process parameters and spray patterns. However, the large number of tablets and the long lasting process time is a huge challenge [1], [2].

In this work numerical simulations of the Discrete Element Method (DEM) are applied to an industrial size coater [3]. We model bi-convex tablets by smart contact algorithms which allows for fully resolved process simulations of several hundred kg of raw material (tablet cores), Fig 1.

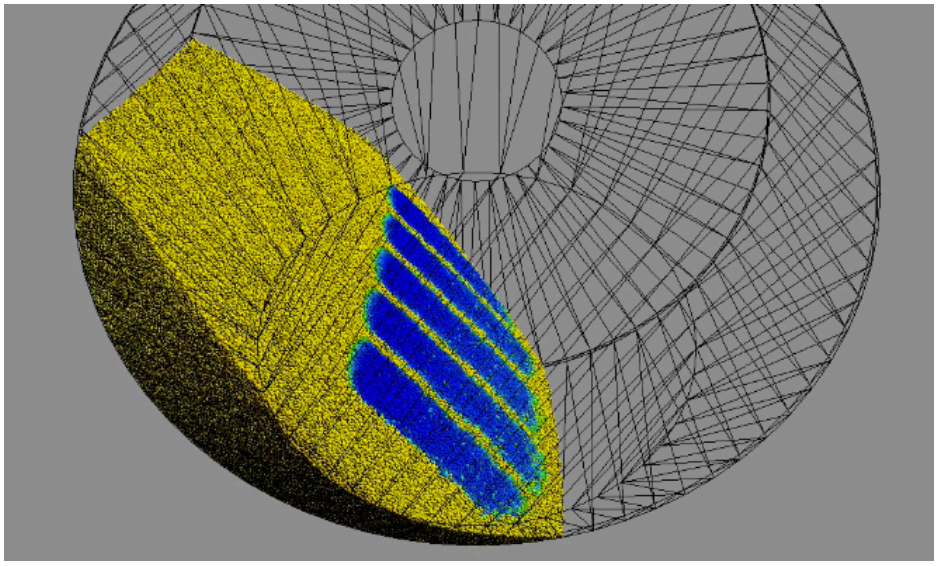

Fig. 1. Spray coating simulation of tablets in a rotating drum (short after beginning). Sprayed tablets are coated (blue) according to their residence time in the five spray zones (green).

The goal was to model the coating process in the computer simulation in order to predict recirculation time, residence time distribution and coating variability. Based on the existing simulation and spray models which accounts for inter-tablet coating, an extension for additional intra-tablet coating will be implemented.

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