

## TRUE-SHAPE TABLET SIMULATIONS AT INDUSTRIAL SCALE

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Tablet coating is a widely used technology in pharmaceutical industry. During this process tablets are covered with a film that fulfils both functional and non-functional purposes. The latter is related to an improved appearance. While the functional purposes include: to protect the tablet core, to mask odor/taste, to control the release of the API, active coating, etc. Uniformity is a critical property to assess the quality of the final product, thus to determine whether the batch will be accepted. Uniformity refers to two aspects: A uniform coating mass distribution among all tablets (inter-tablet uniformity), and a constant film thickness over the surface of a tablet (intra-tablet uniformity). Therefore, the coating process has to be optimized in order to achieve the desired uniformity and reduce the manufacturing costs. Understanding how the different parameters (spray properties, drum geometry, tablet shape, etc.) influence the coating process is a key step in process optimization [1].

Non-spherical but regular geometrical objects such as bi-convex tablets are not any longer approximated by multi-spheres in DEM simulations. The application of transformation algorithms as smart enhancement of [2] allows for fast contact detection and reduces resource allocation on GPU hardware drastically. Industrial-scale simulations of millions of multi-sphere tablets were already performed successfully using the XPS DEM simulation tool (eXtended Particle System, an RCPE in-house code). Now it becomes yet faster, increases capabilities for statistical analysis by the simulation of longer process time and enables to resolve tablet surface for intra-tablet coating investigations in fully resolved coating simulations.

### REFERENCES

- [1] S. Just, G. Toschkoff, A. Funke, D. Djuric, J. G. Khinast, K. Knop, and P. Kleinebudde, "Optimization of Inter-Tablet Coating Uniformity for an Active Coating Process at the Lab and Pilot Scale," *Int. J. Pharm.*, vol. 30, no. 11, (2013).
- [2] Y. Song, R. Turton, F. Kayihan, "Contact detection algorithms for DEM simulations of tablet-shaped particles", *Powder Technology*, **161**, 32-40 (2006).