



národní  
úložiště  
šedé  
literatury

## **The Effects of Agitated Beds Homogenization on Stirrer Geometry and Bed Depth via DEM**

Kohout, M.  
2014

Dostupný z <http://www.nusl.cz/ntk/nusl-175024>

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 30.05.2024

Další dokumenty můžete najít prostřednictvím vyhledávacího rozhraní [nusl.cz](http://nusl.cz) .

# The effects of agitated beds homogenization on stirrer geometry and bed depth via DEM

<sup>1</sup>M. Kohout, <sup>2</sup>T. Trávníčková, <sup>2,3</sup>J. Havlica

<sup>1</sup> Department of Chemical Engineering, Institute of Chemical Technology; Technická 5, 166 28 Prague, Czech Republic; tel. +420 2 2044 3168, e-mail: martin.kohout@vscht.cz

<sup>2</sup> Institute of Chemical Process Fundamentals of the ASCR, v. v. i.; Rozvojova 2/135, 165 02 Prague, Czech Republic

<sup>3</sup> University of Jan Evangelista Purkinje, České mládeže 8, Ústí nad Labem, 400 96, Czech Republic

Granular materials such as packed beds present a unique state of matter and are currently in the urgent need of developing the proper theoretical basis for its basic aspects. A number of attempts have been made to find a way how to characterize the forces between granular particles. In spite of this fact, the present state of affairs is rather unsatisfactory.

One of the possible ways for mathematical modelling of mechanical interactions between particles in granular systems is based on discrete element methods (DEM). In DEM models each particle is represented as a sphere with defined properties (diameter, density, Young's modulus, Poisson ratio, etc.) and is tracked individually [1, 2]. The motion of each sphere is calculated as a sum of external (gravitational force, force given by an agitator) and collision forces (caused by the collision of particles between each other or by the contact of the particle with the wall). Resulting translational and angular velocities than characterize the movement of the particles.

In this contribution open source DEM particle simulation software LIGGGHTS ([www.liggghts.com](http://www.liggghts.com)) was studied and tested. Collision forces are there modelled by the soft-sphere approach with the Hertzian collision model. As an application we studied agitated particle beds (packed from glass spherical particles of two colours – packed vertically and horizontally) mixed by different types of agitators. Dependence of degree of homogenization on particle diameter, particle properties (Young's modulus), and on geometrical aspects (bed depth, agitator position, etc.) will be also discussed.

Acknowledgements: This work was supported by the grant GACR P105/12/0664 from the Czech Science Foundation.

## Literature:

[1] Z. Grof, M. Kohout, F. Štěpánek, *Multi-scale simulation of needle-shaped particle breakage under uniaxial compaction*, Chemical Engineering Science 62, 1418 – 1429, 2007.

[2] J.F. Favier, M.H. Abbaspour-Fard, M. Kremmer, A.O. Raji, *Shape representation of axisymmetrical, non-spherical particles in discrete element simulation using multi-element model particles*, Engineering Computations 16, p. 467 – 480, 1999.