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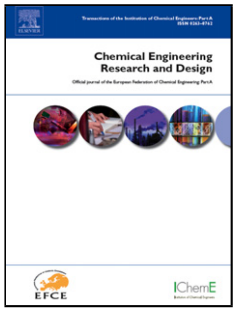

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ACCEPTED MANUSCRIPT

UNWANTED AGGLOMERATION OF INDUSTRIAL AMORPHOUS FOOD POWDER FROM A PARTICLE PERSPECTIVE

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Highlights

- Particle interactions are assessed by Micromanipulation and Atomic Force Microscopy
- Temperature, humidity, contact force, contact time and particle size can be varied
- Contact mechanisms between particles from industrial powders can be investigated
- Basis for modelling is delivered to optimize bulk powder processing
- Caking can be avoided when individual particle interactions are known & controlled

ABSTRACT

Agglomeration is a widely used unit operation in the food industry to improve the properties of fine powders that are often composed of hygrosensitive amorphous material and to generate better flowability, easier handling and a more appealing appearance.

However, unwanted agglomeration can also occur in many processes and during storage and transport. Especially for materials that are sensitive to moisture and temperature, the risk of powder caking or post hardening is high. This leads to a negative perception of the consumer because powder appearance and solubility can be compromised. In extreme cases, a collapse of a powder bed can be induced during processes like fluid bed agglomeration, when the conditions are not suitable for a powder. Too strong agglomeration and particle fusion lead to lumps that soil and block equipment. This can be avoided and waste reduced when individual particle interactions and the conditions governing them are controlled.

Previously, mostly bulk studies have been performed to explore caking. Missing knowledge on the way individual amorphous particles behave under certain process conditions like humidity, temperature, pressure, contact time and deformation can be experimentally accessed via Micromanipulation and Atomic Force Microscopy.

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