



IFPRI Project Abstract

CAPCAP: Controlling Adhesion between Particles for a better understanding of Compaction, Aeration and flow of Powders.

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Project Objective:

The main objective of the project is to understand the rheology of powders to predict their flow properties in various configurations. The project is based on the development of model cohesive materials, on the development of innovative tools to characterize their rheology and infer their constitutive laws, and ultimately study flows in configuration of interest for applications.

Approach:

The approach is mainly experimental. The first step is to develop protocols to synthesize and characterize model cohesive granular materials. The aim is to synthesize particles with tailored properties (stiffness and adhesion) using two techniques (micro-polymer particles, or polymer coated silica particles). The second step is to develop a pressure-imposed shear cell adapted to small particle sizes. The third step will be to study different flow configurations. The last step concerns the coupling with air.

Recent Results:

- development of the protocols to design model adhesive particles with two methods: silica bead coated with polymers; synthesis of polymer particle functionalized thanks to the click chemistry.
 - study of the rheology of the coated particles at relatively high stress level. We have shown the crucial role of the coating in the rheology, which lubricates the contacts and lead to a transition from a frictionless to a frictional rheology when increasing the confining pressure.
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Next Steps:

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- The development of a micro-shear cell dedicated to rheological measurements for particles in the range of 50-200 microns.
 - The synthesis of tailored micro-particles and their mechanical characterization.
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