

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Erosion dynamics of a wet granular medium GAUTIER LEFEBVRE, PIERRE JOP, Surface du Verre et Interfaces UMR 125 CNRS/Saint-Gobain, HETEROGENEOUS REACTIVE MATERIALS TEAM — Liquid may give strong cohesion properties to the granular medium, and confers a solid-like behavior. We study the evolution of a fixed aggregate of wet granular matter subjected to a flow of dry grains. In the confined geometry of a thin cell, the aggregate is hold by the walls, and the dry matter flowing around will pull grains out of the aggregate. Thus, by granular erosion, the interface is modified. Image treatment allows us to follow the shape of the aggregate, and to quantify the erosion speed. We have set-up two configurations of erosion. At the center of a half-filled rotating drum, we introduce the wet material with a determined liquid content. During the rotation, the dry grains flow around the fixed obstacle and grains are pulled-out of the aggregate, reducing its size. This provides an erosion rate, related to the liquid and grains physical properties. We analyze the influence of liquid properties (surface tension, viscosity) and quantity in this geometry. A model based on the fluctuations of the flow explains the dependencies observed in the experiment. In an open cell between vertical plates, we can form a heap-shaped aggregate. Then, with a funnel of constant outlet, we inject dry grains, flowing on top of the cohesive heap. We observe destabilization of an initial flat profile in certain conditions. The coupling between the flow stress and the shape of the heap creates periodical structures, which propagate to the top through the erosion process.

Gautier Lefebvre
Surface du Verre et Interfaces UMR 125 CNRS/Saint-Gobain

Date submitted: 02 Aug 2012

Electronic form version 1.4