

Segregation in Granular Materials: A Study of The Brazil Nut Effect

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Granular materials such as sand and grains, are large conglomerations of discrete macroscopic particles that interact with each other through energy-dissipating contact forces (Umbanhowar, 2003). The dynamics of granular materials is one of the most important research topics and has been widely studied in the last years in the context of nonlinear dissipative systems. However, in spite of this intensive effort on theoretical works, experiments and computational simulations for understanding and eventually controlling the complex phenomenology of granular materials, their behavior is still far from being properly understood (Goldhirsch, 2003). The mixture of granular materials has a wide technological interest, for instance, in the pharmaceutical industry, drugs are often manufactured by mixing particles with different sizes or not. This mixture is implemented by vibration or rotation of the constitutive elements, but it is common to observe pattern formation and segregation of particles (Jaeger *et al*, 1996). Segregation in granular systems occurs both in industrial processes and in nature, as is the case of planetary formation. Thus, the understanding of the dynamics and the mechanisms of segregation is of practical importance.

In this work, we present results for the following problem: There is a large container with particles inside, which is submitted to a vertical shaking. A large particle is added at the bottom of this container. After a time interval, the large particle tends to rise to the top. This phenomenon is known as Brazil Nut Effect (BNE) (Rosato *et al*, 1987), as is consider as the canonical example in granular segregation. We dynamically characterize this phenomenon and we also discuss strategies for controlling the segregation process.

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