



PhD position

Dynamics of agglomerates restructuration under shear. Application to MOX fuel.

Orano – Mines Saint-Etienne partnership

Keywords : granular media; mixing and mixtures ; agglomeration-fragmentation ; DEM

Context & Goals: this research project is part of long term collaboration between the Ecole des Mines de Saint-Etienne (top-ranked French engineering school) and Orano, world leader in nuclear energy. In many industrial processes, solid matter comes in the form of powders and grains and more precisely of agglomerates, which are the assembly of elementary particles (aggregates, crystallite ...) bonded to each other. Under mechanical stress, the structure of these agglomerates can evolve significantly. They can break up in small fragments that sometimes recombine themselves under attractive or cohesive forces to form new agglomerates with a different structure. This fascinating restructuration dynamics is the core of the PhD thesis. The candidate will try to describe these phenomena with the help of the tools developed in our group: numerical simulations with the Discrete Element Method (DEM), experiments on simple materials and theoretical modelling. The candidate will investigate how the different phenomena are influenced by parameters like size, initial agglomerate structure, intra-agglomerate forces, external stress nature and intensity ... After a study on a single-component system, he/she will explore binary mixtures and propose hints to explain experimental observations made on MOX mixtures used in nuclear reactors. Results are intended to be published in top journals of the field and presented by the PhD student in international conferences.

Desired profile and skills: MSc degree in at least on domain among: fluid mechanics, material physics, soft matter physics, numerical simulation. You like modelling and tackling difficult problems. Curiosity, rigor, engagement, critical analysis capacity, listening and of course passion for science and technology are you key assets for successfully defend an excellent thesis. Fluent English + willingness to learn elementary French.

Application: the file includes four items: cover letter + CV + at least one recommendation letter + MSc ranking or academic results.

Miscellaneous: optimally starting 1st of october, 2020. With industrial funding and co-supervision. The candidate will be member of the SPIN centre of the Ecole des Mines de Saint-Etienne ([website](#)) and of the CNRS laboratory UMR 5307. More informations by simple email to bonnefoy@emse.fr. Hiring possibility as an Orano staff after the PhD thesis.