



carlos.montillaestrella@ensiacet.fr

Doctoral School: MEGeP

First year registration: 2018

Funding: ANR IPAF project

Supervisors: Renaud ANSART, Olivier SIMONIN (IMFT)

## INTER-PARTICLE SHORT AND MEDIUM-RANGE ACTION FORCES IN FLUIDIZED BED REACTOR: EXPERIMENTAL AND NUMERICAL COUPLED ANALYSIS

*Forces d'action interparticulaires à courte et moyenne distances dans un lit fluidisé : approche expérimentale et numérique couplées*

Gas-solid fluidized beds is a process in which we have a fluid circulating through a vertical column that contains a high number of solid particles. This kind of reactor are widely used for many industrial processes such as the fluid catalytic cracking of petroleum, production of polyethylene, heat exchangers, biomass gasification, among others.

Due to the very nature of fluidization, which involves significant particle-particle and particle-reactor wall interactions, the occurrence of electrostatic charge generation is almost unavoidable. The overall process upsets associated with this phenomenon includes particle agglomeration, reactor wall fouling generated by particle-wall adhesion, defluidization and electrostatic discharge. Generation of high-voltage electrical fields could cause electrical interferences, adversely affecting process instrumentation, physical shocks to operating personnel and, most significantly, fires, explosions and therefore be a major hazard. The excess accumulation of electrostatic charges can have a severe impact on fluidized-bed dynamics which is a major cause of inefficiency.

Our project has two main objectives: first, to develop a new experimental technique called Electrical Capacitance Volume Tomography to characterize the coupling between hydrodynamics of the gas-solid suspension and inter-particle short and medium-range action forces in fluidized bed reactors. And second, to derive a mathematical model through a multi-scale approach to take into account these forces to simulate a pilot plant reactor using a CFD software in order to design, to control and to optimize industrial fluidized bed reactors.

