# DEM-CFD Simulation of Particle-Drying in Fluidized Bed

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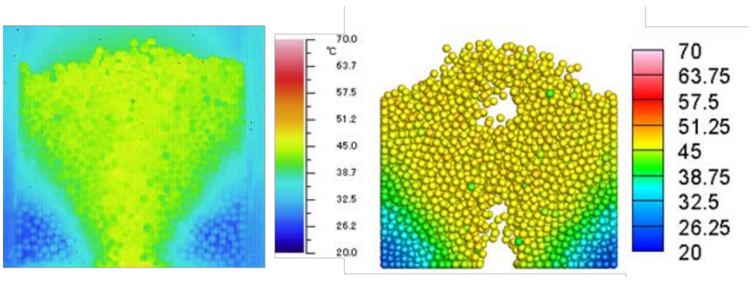
Fluidized bed is used in wide area of industrial applications. When particles are fluidized, they are suspended by the upward-flowing gas and released from the contact forces from adjacent particles. Due to large contact area between gas and particle phases and good mixture of particles in the bed, significant heat and mass transfer between two phases is achieved. By virtue of such advantages, fluidized beds are often used in processes such as drying, combustion, catalytic reaction, calcination. Owing to the progress of computers, numerical simulation by discrete particle models becomes popular. DEM (Discrete Element Method) - CFD (Computational Fluid Dynamics) coupling model is widely used in fluidized bed simulation. The model extension to include heat and mass transfers has been performed by some researchers while it is still limited. In the present study, a DEM - CFD coupling model is proposed for particle-drying process in fluidized bed and validation study is performed. In the proposed model, heat transfers through inter-particle, gas-particle, particle-wall, gas-wall are taken into account. The drying of porous particle is modeled by assuming a double-layer structure inside of moist particle: the outer crust and the wet center core layers. A number of bench-scale experiments are performed. Silica-gel particle is used as a test material and its drying behavior is observed in a pseudo 2-D bed where hot dried air is injected. In addition to the moisture content change of particles, its temperature is also measured by using an infrared thermography camera. Figure 1 shows the comparison of temperature distribution of the particles. Hot gas is injected from the bottom center of the bed and particles are fluidized and dried. Current status and future perspective of the model development are discussed in the presentation.




(a) Experiment (b) Simulation

Figure 1 Particle temperature distributions