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Flow structure spontaneously formed in 3-D bubbling gas-fluidized bed[1] TAKUYA TSUJI, KEIZO YABUMOTO, TOSHIHIRO KAWAGUCHI, TOSHITSUGU TANAKA, Osaka University — Bubbling gas-fluidized beds are widely used in vast engineering applications. Bubbles spontaneously formed in the bed enhance the dispersion and mixing of the particles and it greatly contributes to the improvement of equipment performance. Hence, it is important to know about the bubbles' behavior and the flow structures induced by bubbles. However, much is not known yet because the flow inside of the bed is unsteady and quite complex. In addition, it is difficult to observe the internal flow structure due to the existence of regions of high particle concentration. In the present study, the flows occur in a large-scale 3-D bubbling gas-fluidized bed are numerically investigated by a Eulerian-Lagrangian coupling scheme between discrete element method and computational fluid dynamics (DEM-CFD). The code was parallelized and nine million particles are tracked in the maximum case. Three-dimensional bubble's shape and its behaviors are directly observed. Circulation structures of the flow induced by bubbles are also verified in detail. Bubbles are preferentially generated under the uniform inflow condition and induce upward flows in the bed.

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