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Numerical studies of three phase gas-liquid-solid mixtures LEI ZENG, JIACAI LU, GRETAR TRYGGVASON, Department of Mechanical Engineering, Johns Hopkins University, MD, USA — Three phase gas-liquid-solid mixtures are encountered in several important industrial processes. Those included bubbles rising through slurries, such as in the FischerTropsch process where the particles are metal catalysts, in bubble columns where large particles are sometimes inserted to enhance mass transfer, and in mineral processes where bubbles are used to capture hydrophobic particles and float them out of a slurry. Here, we examine the dynamics of three phase flow using numerical simulations of many bubbles and drops, using a front tracking/finite volume method. The particles, which are assumed to be much smaller than the bubbles, are modeled as very viscous drops and kept nearly spherical by high surface tension. We examine the dynamics of the flow for a range of governing parameters and quantify how the dynamics of one phase is changed by the presence of another phase by looking at pair probability, correlation lengths, energy balance and other quantities, as well as comparing with results where only one of the phases is present. Preliminary simulation of froth flotation, where the drops stick to a bubble and accumulate in a foam at the top are also shown.

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