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Numerical study of dynamic behavior of contact line approaching a micro-scale particle YUSUKE MIYAZAKI, Dept. of Mechanical Engineering, Tokyo University of Science, TAKAHIRO TSUKAHARA, ICHIRO UENO, Research Institute for Science & Technology, Tokyo University of Science — The behavior of contact line (CL) the boundary line of solid-liquid-gas interface is one of the important topics regarding the dynamic wetting. Many experimental and theoretical approaches have been performed about static and axisymmetric systems: e.g., Ally et al. (Langmuir 2010 vol. 26, 11797) measured the capillary force on a micro-scale particle attached to a liquid surface and they compared with their physical model. However, there are few numerical simulations of the dynamic and asymmetric systems Focusing on the CL passing micro-scale solid particles, we simulated solid-liquid-gas flows. Gas-liquid interface is captured by a VOF method and the surface tension model is the CSF model. Solid-fluid interaction is treated by an immersed boundary method. We studied the broken-dam problem with a fixed sphere in either macro or micro scale. Our results of the macro scale agree reasonably with the experimental result. In the micro scale, where the domain is of $2.0 \times 2.0 \times 2.0$ μm^3 and the sphere diameter is 0.5 μm, we tested two types of sphere surface: hydrophobic and hydrophilic solids. We demonstrated that, as the liquid touches the hydrophilic sphere, the velocity of CL is higher than the hydrophobic case.

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