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Interaction Between Fibers and Viscous Flow Evaluated by Simplified Bead-Chain Model and Generalized SPH YOSHIAKI ABE, TOMONAGA OKABE, Tohoku University — This study investigates the motion of short fibers in melted resin for a three-dimensional (3D) printing process. We developed a numerical model for fiber and viscous-flow interaction problems based on the generalized smoothed particle hydrodynamics (generalized SPH) and the simplified bead-chain model (SBCM) for short fibers. The generalized SPH allocates particles inhomogeneously in a physical space and arranges them via mapping in a generalized coordinate system where the particles are aligned at a uniform spacing, which allows efficient simulation compared with conventional Cartesian SPH approaches. The SBCM models each fiber as a chain of spheres given by a single equation of translational motion. The effects of bending and hydrodynamic torques are converted to equivalent translational forces, which significantly simplifies the governing equations and results in a more cost-effective simulation than conventional models such as the BCM or classical microstructure-based fiber suspension model. This study proposes the SBCM-SPH model for predicting a fiber-flow interaction and investigates the motion of short fibers in the fused decomposition modeling process of 3D printer.

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