Embedded Eulerian-Lagrangian two-phase modelling of inkjet printing.

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ABSTRACT

An embedded Eulerian-Lagrangian two-phase model for inkjet printing modelling is presented. Inkjet printing is often used in industrial applications such as 3D printers and printers for catalyst layer fabrication in fuel cells. While typically this kind of problem is modelled using an Eulerian framework equipped with either the Volume of Fluid or the level-set method, an embedded approach is developed here. The ink is modelled using a Lagrangian formulation, whereas the air adopts an Eulerian framework. This approach allows exact tracking of the inkjet deformation and enables natural representation of the discontinuity across the water/air interface. Moreover, the computational cost can be reduced since one can solve the problem by only modelling the liquid domain. A dynamic contact angle condition is implemented to model the interaction between the nozzle walls and the ink. The implicit treatment of the surface tension term allows for using relatively high time steps. The numerical results are compared with previous studies found in literature to analyse different effects such as nozzle shape or pressure pulse during the inkjet process.