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Numerical study of liquid-gas flow on complex boundaries SHENG WANG, OLIVIER DESJARDINS, Sibley School of Mechanical and Aerospace Engineering, Cornell University — Simulation techniques for liquid-gas flows near solid boundaries tend to fall two categories, either focusing on accurate treatment of the phase interface away from wall, or focusing on detailed modeling of contact line dynamics. In order to fill the gap between these two categories and to simulate liquid-gas flows in large scale engineering devices with complex boundaries, we develop a conservative, robust, and efficient framework for handling moving contact lines. This approach combines a conservative level set method to capture the interface, an immersed boundary method to represent the curved boundary, and a macroscopic moving contact line model. The performance of the proposed approach is assessed through several simulations. A drop spreading on a flat plate and a circular cylinder validate the equilibrium contact angle. The migration of a drop on an inclined plane is employed to validate the contact line dynamics. The framework is then applied to perform a 3D simulation of the migration of a drop through porous media, which consists of irregular placed cylinders. The conservation error is shown to remain small for all the simulations.

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