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A hybrid simulation of the atomistic-continuum methods for fluid flows on superhydrophobic surfaces GUOWEI HE, QIANG LI, LNM, Institute of Mechanics, Chinese Academy of Sciences — It has been found from recent experiments that the fluid flows on superhydrophobic surfaces could have the slip length as large as the order of a micro-meter. The superhydrophobic surfaces can be achieved by patterning roughness on hydrophobic surfaces. In the present paper, an atomistic-continuum hybrid approach is developed to simulate the Couette flows over superhydrophobic surfaces, in which a molecular dynamics simulation is used to a small region near the superhydrophobic surface where the continuum assumption is not valid and the Navier-Stokes equations are used in a large region for bulk flows where the continuum assumption does hold. These two descriptions are coupled using the dynamic coupling model in the overlap region to ensure the momentum continuity. The hybrid simulation predicts a superhydrophobic state with the large slip lengths which cannot be obtained by molecular dynamics simulation alone.

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