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Liquid Jet impingement on superhydrophobic metal-mesh substrates SHASHWATA MOITRA, TAMAL ROY, University of Illinois at Chicago, RANJAN GANGULY, Jadavpur University, CONSTANTINE M MEGARIDIS, University of Illinois at Chicago — Liquid jet-impact on permeable substrates has a variety of applications especially in heat transfer, liquid fuel atomization, incontinence products and solid substrate erosion. We study liquid-jet impact on superhydrophobic metal meshes and investigate the radial spreading and throughflow of the liquid. The effect of liquid properties (density, surface tension and viscosity) and the permeability of the mesh on the pre-breakthrough hydraulic jump, breakthrough velocity and the post-breakthrough distribution of the liquid were studied. The hydraulic jump radius on the pre-breakthrough side of the mesh increases with rising jet velocity and is independent of the liquid properties or mesh geometry. The breakthrough velocity increases with the surface tension of the liquid and decreases with the mesh opening diameter and the viscosity of the liquid. The theoretical prediction of the breakthrough velocities from a simple analytical model is in accordance with the experimental observations. In the post-breakthrough regime (mesh underside), the liquid flow rate through the pores showed an initially steep increase, followed by a subsequent plateauing with increasing jet velocity, probably as the impact area of the mesh underwent a Cassie-Baxter-to-Wenzel transition.

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