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Directional transport of impinging capillary jet on wettability engineered surfaces ARITRA GHOSH, SOUVICK CHATTERJEE, PALLAB SINHA MAHAPATRA, Univ of Illinois - Chicago, RANJAN GANGULY, Jadavpur University, CONSTANTINE MEGARIDIS, Univ of Illinois - Chicago — Impingement of capillary jet on a surface is important for applications like heat transfer, or for liquid manipulation in bio-microfluidic devices. Using wettability engineered surfaces, we demonstrate pump-less and directional transport of capillary jet on a flat surface. Spatial contrast of surface energy and a wedge-shape geometry of the wettability confined track on the substrate facilitate formation of instantaneous spherical bulges upon jet impingement; these bulges are further transported along the superhydrophilic tracks due to Laplace pressure gradient. Critical condition warranted for formation of liquid bulge along the varying width of the superhydrophilic track is calculated analytically and verified experimentally. The work throws light on novel fluid phenomena of unidirectional jet impingement on wettability confined surfaces and provides a platform for innovative liquid manipulation technique for further application. By varying the geometry and wettability contrast on the surface, one can achieve volume flow rates of $\sim$ O(100 μL/sec) and directionally guided transport of the jet liquid, pumplessly at speeds of $\sim$ O(10cm/sec).

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