Abstract Submitted
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Design, fabrication, and analysis of a capillary diode for water-oil separation[1] DHIRAJ NANDYALA, ZHEN WANG, DAVID HWANG, THOMAS CUBAUD, CARLOS COLOSQUI, State Univ of NY - Stony Brook, PROF. HWANG'S GROUP COLLABORATION, PROF. CUBAUD'S GROUP COLLABORATION — A capillary slit is designed and fabricated with a micro/nanopatterned section enhancing surface wettability in order to work as a fluidic diode with vanishingly small hydrodynamic conductance for vertical imbibition when immersed in liquid above a critical depth. A large surface energy barrier at the junction between the patterned and non-patterned surface sections of the slit produces a finite immersion depth for liquid imbibition (i.e., "forward" capillary conduction). The finite critical immersion depth for forward conduction is controlled by the geometric design of the slit channel and micro/nanopattern, and the surface energy of the wetting fluids. The studied capillary device can work as a fluidic diode for water and behaves as a conventional capillary slit for the imbibition of oils. A prototype device with simple geometric design is demonstrated for the selective adsorption and separation of water and oil in vertical imbibition experiments at controlled immersion depths. Theoretical and experimental results indicate that the studied fundamental mechanism for selective liquid imbibition has potential application in simple devices for passive water-oil separation.

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