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Droplets on porous hydrophobic surfaces perfused with gas: An air-table for droplets NIKOLAOS VOURDAS, VASSILIS STATHOPOULOS, Technological Educational Institute of Sterea Ellada, LABORATORY OF CHEMISTRY AND MATERIALS TECHNOLOGY TEAM — Wetting phenomena on porous hydrophobic surfaces are strongly related to the volume and the pressure of gas pockets resided at the solid-liquid interface. When the porous medium is perfused with gas by means of backpressure an inherently sessile pinned droplet undergoes various changes in its shape, contact angles and mobility. This provides an alternative method for active and controlled droplet actuation, without use of electricity, magnetism, foreign particles etc. Superhydrophobicity is not a prerequisite, electrode fabrication is not needed, the liquid is not affected thermally or chemically etc. In this work we explore this method, study the pertinent underlying mechanisms, and propose some applications. The adequate backpressure for droplet actuation has been measured for various hydrophobic porous surfaces. Backpressure for actuation may be as low as some tens of mbar for some cases, thus providing a rather low-energy demanding alternative. The droplet actuation mechanism has been followed numerically; it entails depinning of the receding contact line and movement, by means of a forward wave propagation reaching on the front of the droplet. Applications in valving water plugs inside open- or closed- channel fluidics will be provided.

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