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Diffusio-osmotic control in microfluidic devices BENJAMIN ABECASSIS, DAVID HUANG, CECILE COTTIN-BIZONNE, CHRISTOPHE YBERT, LYDERIC BOCQUET, Université de Lyon — We present recent work aiming at exploring the possibilities offered by diffusio-phoretic phenomena in the context of microfluidic devices. Such phenomena are associated to the generation of surface-induced liquid flows in response to an imposed external gradient of solute concentration. Using a ψ-shaped microchannel to establish a well-controlled gradient of electrolyte, we first demonstrate experimentally that diffusiophoresis phenomena can be used to perform various microfluidic functionalities: particle manipulation, sorting, concentration, etc. Moreover, we provide a theoretical description that quantitatively accounts for all observed behaviors [1]. We then extend the theoretical analysis to incorporate the possible modification of surface hydrodynamical properties offered when moving to hydrophobic or superhydrophobic surfaces. Diffusioosmosis responses are found amplified by the presence of surface slippage to an extend that can reach up to 3 orders of magnitude with superhydrophobic surfaces. On the basis of such predictions, a source-free osmotic pumping device is proposed for microsystems [2].

[1] B. Abecassis *et al.*, *Nature Mat.* (2008), **in press**.
[2] D. Huang *et al.*, *Phys. Rev. Lett.* (2008), **in press**.

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