ELECTRO INTRUSION

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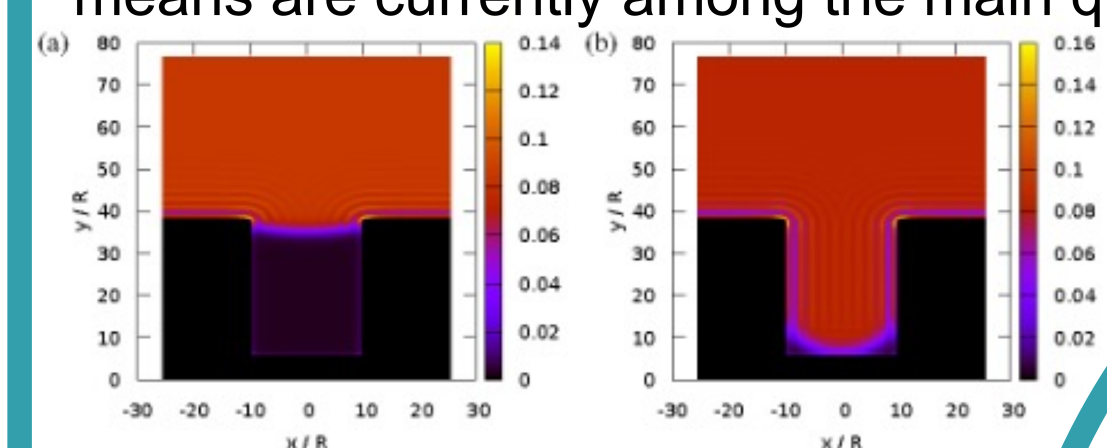
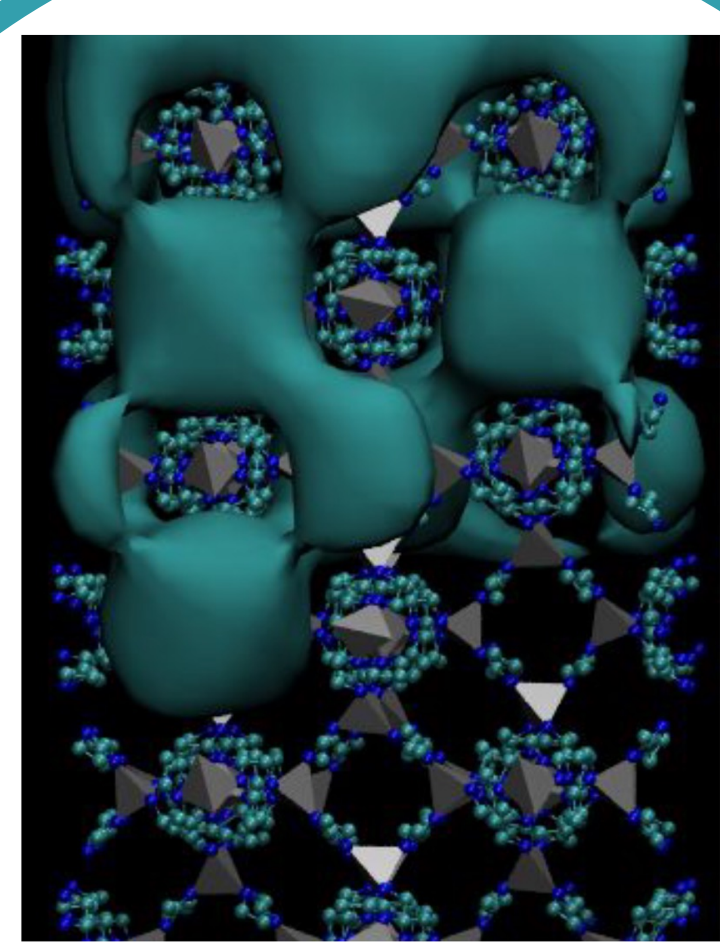
Intrusion and extrusion of liquids in highly confining media: bridging fundamental research to applications

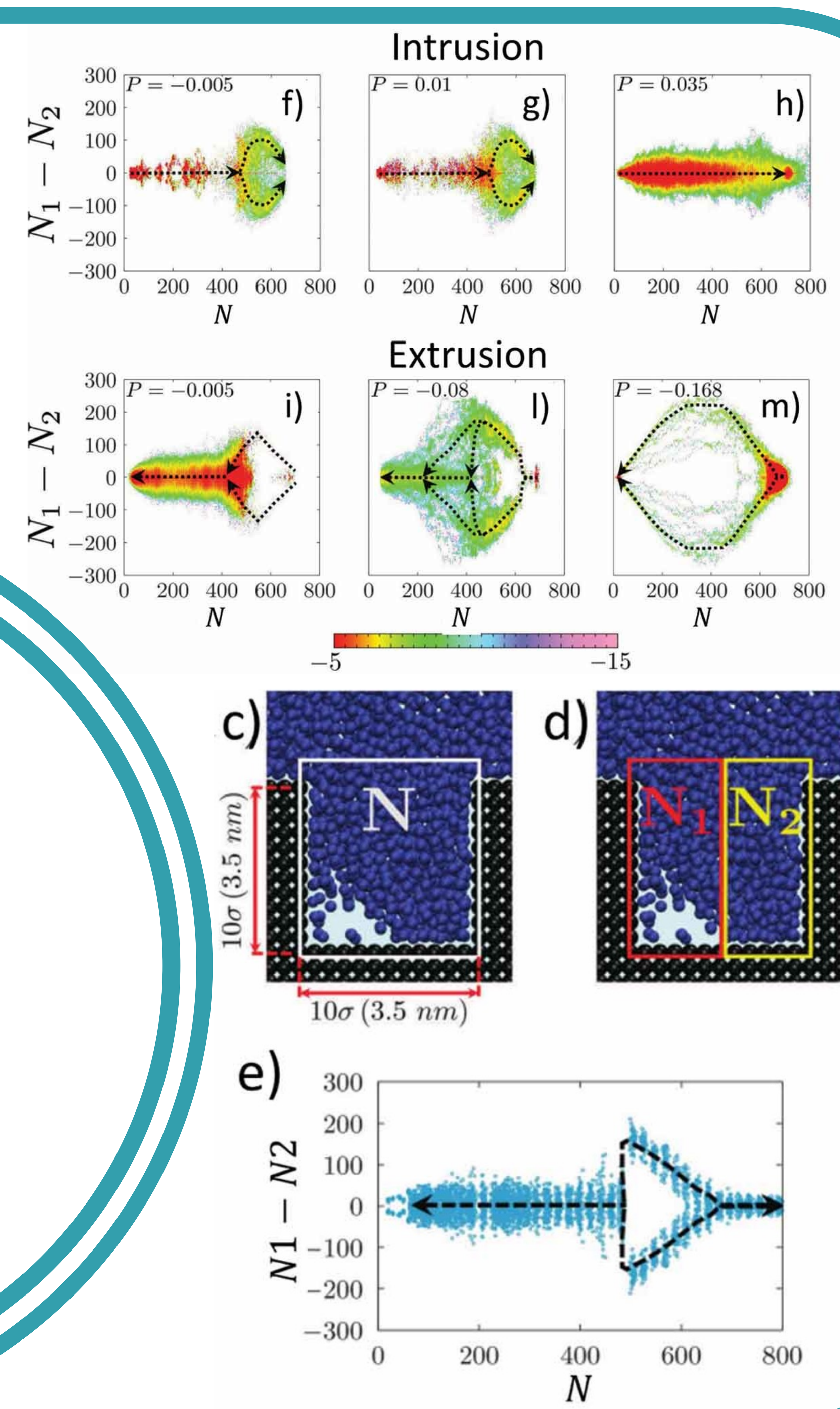
Wetting and drying of pores or cavities, made by walls that attract or repel the liquid, is a ubiquitous process in nature and has many technological applications including liquid separation[1], chromatography[2], energy conversion and storage[3-4], biological and bioinspired channels[5]. Understanding under which conditions intrusion/extrusion takes place and how to control them by chemical/physical means are currently among the main questions in the field.

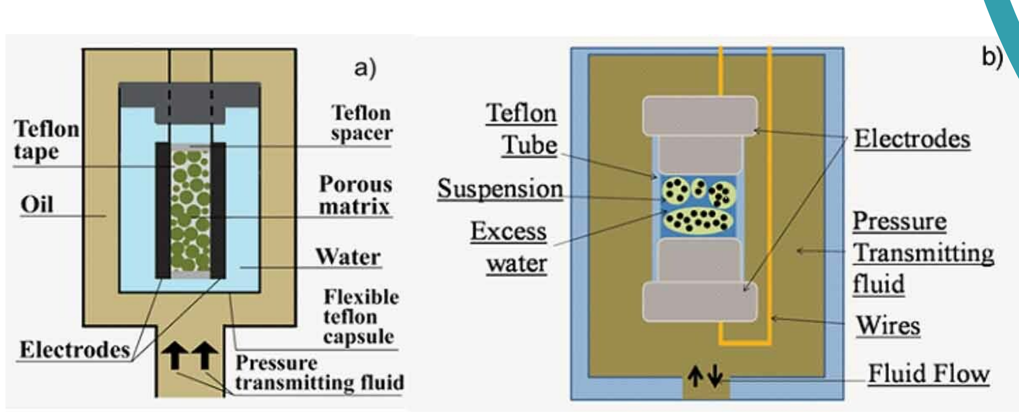


Color map of the density field of a liquid in contact with a hydrophobic surface with a 2D squared pore. The two panels show the two (meta)stable state of the liquid

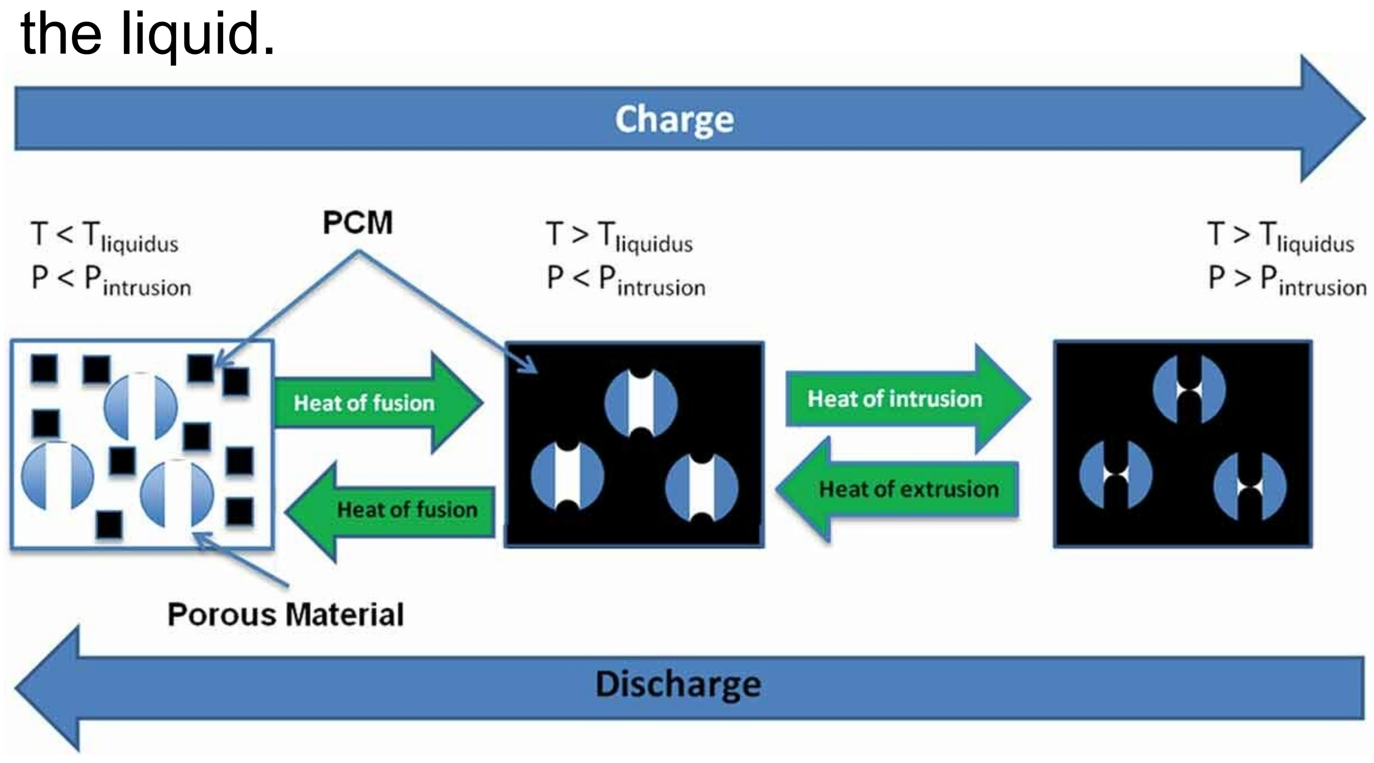


Partially intruded ZIF-8

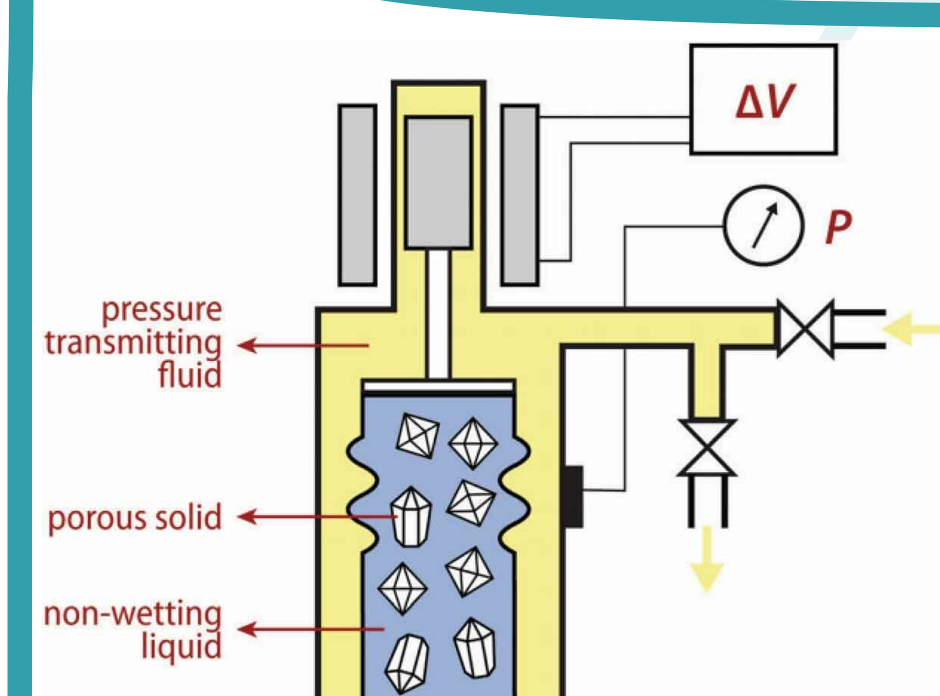




Different configurations of a high-pressure cell for recording electrification effects during intrusion-extrusion: a) hermetic flexible Teflon capsule containing two electrodes filled with a porous material and a non-wetting liquid. b) Flexible Teflon tube is filled with the porous material and the liquid.



Thermal energy storage using melting-intrusion-extrusion-solidification cycle.



Sketch of an intrusion-extrusion porosimeter. A sample of lyophobic porous solid powder is placed in a liquid (in blue) and the pumps control the pressure of a pressure-transmitting fluid (in yellow). A Manometer records the pressure P during the experiment, and a transducer records changes in volume of the system.

Reference

1. Yang H-C, Hou J, Chen V, et al. *Ang. Chem. Int. Ed.* (2016) 55,13398–13407. **2.** Gritti F, Brousmiche D, Gilar M, et al. *J. Chromatogr. A* (2019) 1596, 41–53. **3.** Eroshenko V, Regis R-C, Soulard M, et al. *J. Am. Chem. Soc.* (2001) 123, 8129–8130. **4.** Grosu Y, Mierzwa M, Eroshenko VA, et al. *ACS Appl. Mater. Interfaces* (2017) 9, 7044–7049. **5.** Tortora M, Meloni S, Tan BH, et al. *Nanoscale* (2020) 12, 22698–22709.

www.electro-intrusion.eu

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