

## Ciclo di incontri – Tavolo di discussione

### **INTRUSION-EXTRUSION OF NON-WETTING LIQUIDS INTO-FROM FLEXIBLE NANOPOROUS MATERIALS FOR ENERGY-RELATED APPLICATIONS**

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The development of efficient methods for energy conversion is a crucial challenge dictated by globally increasing energy consumption. Thermal-to-mechanical energy transformation is particularly important. At the same time, the rapid development of nanotechnology has created a demand for intelligent, high energy density and efficient methods, which can be easily scaled down to the nanoscale. In this presentation our recent results on exploitation of flexible nanoporous materials for energy-related applications are presented. In particular, it is discussed how intrusion-extrusion (wetting-drying) of flexible superhydrophobic nanoporous materials by water can be used to achieve compact thermal actuation [1], unprecedented negative compressibility [2, 3] and smart pressure transmitting fluids with vibrations dissipation capability [4]. The obtained results are discussed in the context of thermal-to-mechanical energy conversion as well as for micro/nanofluidics.

- [1] M. Chorążewski et al., Compact Thermal Actuation by Water and Flexible Hydrophobic Nanopore. ACS Nano. 2021.
- [2] Tortora M. et al., Giant Negative Compressibility by Liquid Intrusion into Superhydrophobic Flexible Nanoporous Frameworks. Nano Letters, 2021.
- [3] P Zajdel, M et al., Inflation Negative Compressibility during Intrusion-Extrusion of a Non-Wetting Liquid into a Flexible Nanoporous Framework. J. Phys. Chem. Lett. 2021.
- [4] Lowe A. et al., Effect of flexibility and nanotriboelectrification on the dynamic reversibility of water intrusion into nanopores: Pressure-transmitting fluid with frequency-dependent dissipation capability. ACS Appl. Mater. & Interf. 2019.



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