

Exploring flexible nanoporous materials for energy-related applications

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] as well as unprecedented negative compressibility [2, 3]. The obtained results are discussed in context of thermal-to-mechanical energy conversion as well as for micro- / nanofluidics.

[1] M. Chorążewski, P. Zajdel, T. Feng, D. Luo, A. R. Lowe, C. M. Brown, J. B. Leão, M. Li, M. Bleuel, G. Jensen, D. Li, A. Faik, Y. Grosu. Compact Thermal Actuation by Water and Flexible Hydrophobic Nanopore. *ACS Nano*. **2021**. Just accepted. DOI: 10.1021/acsnano.1c02175.

[2] Tortora M., Zajdel P., Lowe A.R., Chorążewski M., Leão J.B., Jensen G.V., Bleuel M., Giacomello A., Casciola C.M., Meloni S., Grosu, Y. Giant Negative Compressibility by Liquid Intrusion into Superhydrophobic Flexible Nanoporous Frameworks. *Nano Letters*, **2021**, 21(7), pp.2848-2853.

[3] P Zajdel, M Chorążewski, J B Leão, G V Jensen, M Bleuel, H-F Zhang, T Feng, D Luo, M Li, A R Lowe, M Geppert-Rybczynska, D Li, Y Grosu. Inflation Negative Compressibility during Intrusion-Extrusion of a Non-Wetting Liquid into a Flexible Nanoporous Framework. *J. Phys. Chem. Lett.* **2021**. Just accepted.