Lydéric Bocquet
Institut Lumière Matière, Université Lyon 1
and CEE, MIT

Fluid transport at the nanoscales and application to osmotic energy harvesting

« There is plenty of room at the bottom ». This visionary foresight of R. Feynman, introduced during a lecture at Caltech in 1959, was at the root of numerous scientific and technological developments, taking benefit of the "strange phenomena" occuring at the smallest scales. There remains however a lot to explore, in particular in the context of fluids at the nanoscales and their specific transport properties. The great efficiency of biological nanopores, such as aquaporins, in terms of permeability or selectivity is definitely a great motivation to foster research in this direction. How to reach such efficiency in artificial nano-systems, and build new devices taking benefit of the strange transport behavior of fluids at nanoscales is still an open question.

In this talk, I will discuss some theoretical and experimental results obtained in our group on the fluid transport at the nanoscales, in particular inside nanopores, nanochannels and nanotubes. More specifically, I will focus on the study of transport inside a single Boron-Nitribe nanotube. Using a nano-assembly route with nanostructures as building block, we have built a dedicated trans-membrane nanofluidic device allowing to study fluid and ionic transport across a single nanotube. Experiments show unprecedented energy conversion from salt concentration gradients. Applications in the field of osmotic energy harvesting will be discussed.