Labex MATISSE

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« Project title »

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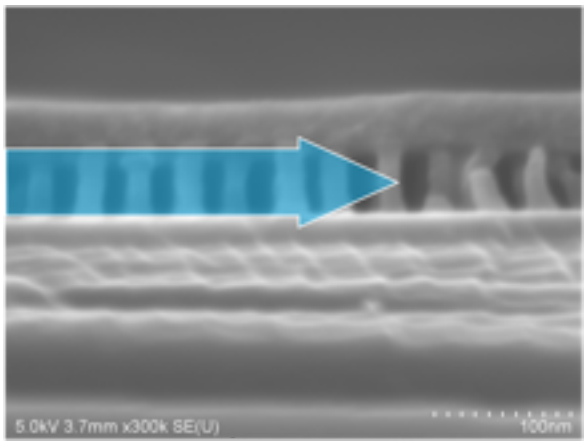

Hosting laboratories, teams and and thesis supervisors names:

LCMCP : Prof. David Grosso, Dr. Marco Faustini
PHENIX : Prof. Marie Jardat, Dr. Vincent Dahirel

Research project

The aim of my project is to develop a low-cost bottom-up based lab-on-a-chip nanofluidic device for biomedical or analysis applications. Common researches try to create such kind of devices by realizing high-cost top-down (e-beam lithography in example) nanochannels. In this thesis much cheaper bottom-up nanoporous materials are analyzed. Fundamental aspects of nanofluidics have to be studied in these materials in order to fully exploit their potentiality. A final step of coupling with microfluidic channels is performed in order to allow connecting this device with previously studied microfluidic circuitry. Capillarity and electro-osmosis in these materials are studied and analyzed as the driving forces for separations in the device both experimentally and computationally. The diffusion of species (without and with an electric field) is studied experimentally and then simulated through Stochastic Rotation Dynamics.

Summerize your scientific results & impacts

Deposition method to extremely reduce the price and tailor the properties of nanofluidic devices has been developed. Capillary filling in nanofluidic systems has been studied and related to the capillary condensation inside the porosity. The capillary filling speed was simulated and related to true values. Diffusion of fluorophores, proteins in the PPNs is being analyzed as the reactions between inorganic precursors in such nanoconfined space.

Main key facts

Davide Raffaele Ceratti et al. *Advanced Materials* (submitted).
Davide Raffaele Ceratti et al. *Molecular Physics* (accepted)
Davide Raffaele Ceratti et al. *Nanoscale* 02/2015; 7(12).
Mickael Boudot, Davide R Ceratti et al . *The Journal of Physical Chemistry C* 09/2014; 118(41)
Marco Faustini, Davide R Ceratti et al. *ACS Applied Materials & Interfaces* 08/2014; 6(19)

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