Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

Vendredi 17 décembre
14h00
Centre de Nanosciences et de Nanotechnologies
10 boulevard Thomas Gobert
91120 Palaiseau
Amphithéâtre

« Electropreconcentration in nanofluidic devices: predict and experimentally demonstrate stacking/focusing regimes. »

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Jury members :

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Abstract :
Detection of low concentrated analytes in complex samples is one of the most interesting challenges in bioanalysis. Electropreconcentration based on ion concentration polarization (ICP) effect inside nanofluidic devices appears as an interesting alternative to simultaneously concentrate and detect biomolecules. ICP is induced across nanochannels that play the role of ion-selective filter between microchannels and results in enrichment and depletion zones with high and low conductivity media on opposite sides of the nanochannel where an analyte can focus and therefore concentrate. In this context, the aim of my PhD work is to study preconcentration of chosen analytes in h- PDMS/glass chips incorporating multiple vertical nanochannels. I present 2D numerical simulations of electrophoresis of background electrolyte (BGE) and ionic species inside a micro/nano/fluidic structure using COMSOL Multiphysics® software. These
models permits to study first the ICP effect of BGE and then the preconcentration of the analytes. Numerical simulations predict the cathodic stacking (CS) and cathodic focusing (CF) regimes of anionic analytes at nanofluidic interfaces. As part of my experimental work, I studied the role of nanochannel length and width for three model molecules, fluorescein, ovalbumin and hepatitis C DNA. Fluorescein is stacked/focused at the cathode reservoir thanks to its high mobility and the ovalbumin and DNA are preconcentrated at the anode reservoir thanks to their lower mobility.