

Internship and PhD PROPOSAL

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DNA and RNA sensing with graphene transistor arrays

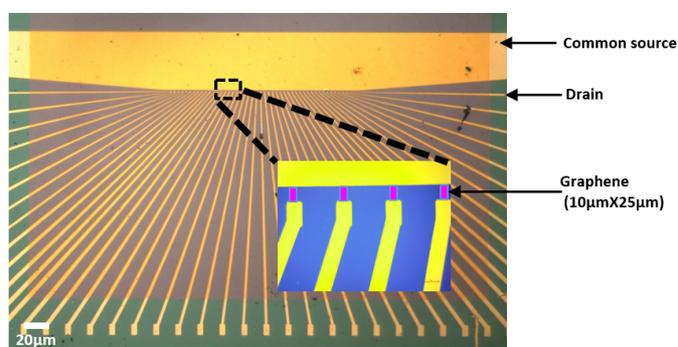
Graphene is a very promising material for numerous applications. It consists of a carbon monolayer that combines several supreme properties, like extreme mechanical strength and exceptionally high electronic and thermal conductivities. We perform research on biosensing with graphene, bringing together the experience in single-molecule biophysics and electronic detection of the Bockelmann group with the experience on CVD growth and high-frequency conductivity characterisation of graphene of the Plaçais group.

Graphene exhibits very high intrinsic room-temperature mobility. Its two-dimensional character allows designing field-effect sensors with nanometer distance between the probe molecules and the two-dimensional gas of electrons and holes, thus promising very high sensitivity. Over the past three years, we developed an innovative process for the fabrication of graphene field-effect transistor arrays for biosensing and obtained very promising first results on electronic detection of DNA hybridization. Importantly, our fabricated devices conserved the exceptional electronic properties of the graphene sheet and we indeed observe an exceptionally high sensitivity in DNA detection.

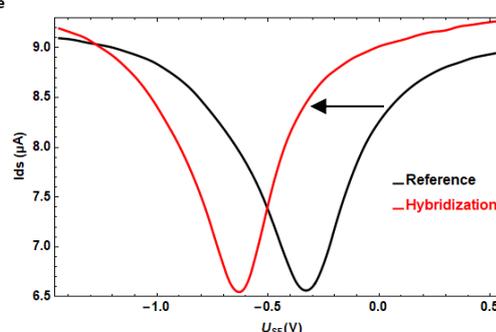
The goals of the present PhD work are twofold. On the one hand, we wish to improve our graphene sensor arrays in terms of homogeneity, reusability and sensitivity, in order to further exploit the exceptional potential of graphene for biosensing. On the other hand, we wish to apply the sensing arrays to nucleic acid-based detection of selected DNA and RNA viruses. Towards the first goal, the PhD student will work in collaboration with the Plaçais group of Ecole Normale Supérieure (ENS) and use clean-room facilities at ENS and University Paris VII. Towards the second goal, she (or he) will work on the molecular biology protocol in collaboration with two senior members of our group at Institut Cochin, Thierry Bizebard CNRS researcher and biochemist and Frédéric Arieu professor at University Paris V and medical doctor at the Cochin hospital.

Electronic hybridization detection in microarray format and DNA genotyping

A. Blin, I. Cissé and U. Bockelmann. *Scientific Reports* 4, 4194 (2014)



Microscopic image of a graphene transistor array



DNA detection with a graphene transistor