

Graphene-sensitized biosensors

During my short stay in San Sebastian, I have been able to explore the many possibilities offered by graphene together with Prof. Rainer Hillenbrand's group at CIC Nanogune. A first set of ideas was mainly concerned with graphene-sensitized biosensors in which plasmonic resonators were to be merged with graphene in order to get improved sensitivity and benefit to the maximum of graphene tunable properties. With operation frequencies centred around the mid infrared range, this kind of structures have very good prospects for biological applications and combine perfectly the expertise of both our groups. Preliminary experimental results present unexpected features and it has been planned to investigate these synergistic effects by simulations but also near-field spectroscopy in order to distinguish between local changes in the graphene and features arising through periodic or collective modulation of the plasmonic structures. Last, the visit was coinciding with the ESF Bionanosense day of the NFO12 conference which has helped further to clarify the aims, trends and boundaries of what can be reached with nanosensing. A couple of additional ideas have also popped up during the event.

On a second stage, the recent work of Hillenbrand's group on gate-tunable plasmons in a graphene wedge has shown for the first time the existence of plasmons in graphene and has opened up another path for a collaboration, namely translate our knowledge of plasmonics to graphene-based nanostructures. Very fresh, this project is really exciting and could bring unprecedented mode size, loss efficiency and field concentration. Both numerical and experimental works are being undertaken.