Graphene based platforms for biosensing applications

Eden Morales, Luis Pires, Arben Merkoçi

Nanobioelectronics & Biosensors Group

Catalan Institute of Nanoscience and Nanotechnology (ICN2)

Campus UAB, Bellaterra (Barcelona), Spain

arben.merkoci@icn.cat

Graphene due to its mechanical, electronic, chemical, optical and electrochemical properties, represents the most interesting building block for biosensing technology. The possibility of conjugating graphene with biomolecules has received particular attention with respect to the design of chemical sensors and biosensors. Among the various graphene forms graphene oxide (GO) displays advantageous characteristics as a biosensing platform due to its excellent capabilities for direct wiring with biomolecules, heterogeneous chemical and electronic structure, the possibility to be processed in solution and the availability to be tuned as insulator, semiconductor or semi-metal. Moreover, GO bears the photoluminescence property with energy transfer donor/acceptor molecules exposed in a planar surface and even can be proposed as a universal highly efficient long-range quencher, which is opening the way to several unprecedented biosensing strategies. The rationale behind the use of the various graphene forms in optical and electrochemical (including reduced graphene) biosensing will be discussed. Taking advantage of the graphene properties we are developing simple, sensitive, selective and rapid biosensing platforms based on this emerging advantageous material. The developed devices have potential interest for biomedical application, environmental monitoring, safety and security.