

# Graphene-based materials in sensors and biosensors

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## Abstract

A general overview on the graphene-related materials (GRM) such as graphene oxide (GO) and graphene quantum dots (GQDs) with interest in (bio)sensors application will be given. We take advantages of GRMs characteristics to design and fabricate innovative cost-efficient (bio)sensing platforms and even smart devices such as nano/micromotors for a myriad of applications. Both optical and electrical properties of GRMs are exploited. For optical-based platforms we explore phenomena such as quenching of the fluorescence induced by GO or photoluminescence of GQDs that can easily operate in synergy with various other nanomaterials opening the way to several unprecedented biosensing strategies. For electrical-based platforms we take advantages of electrical properties of GRM including laser scribed ones patterned onto paper/plastic while building electrical/electrochemical sensing device and unique, simple nanomotors. Taking advantage of GRMs we are developing simple, sensitive, selective and rapid biosensing platforms that include: a) GO – based microarray & laterals flow technologies taking advantages of high quenching efficiency of GO. A “turn ON by a pathogen” device will be shown as a highly sensitive detection system using plastics or paper/nanopaper substrates; b) GQDs–based sensors for contaminants detection based on the use of multifunctional composite materials that enable rapid, simple and sensitive platforms in connection to smartphone; c) electroluminescent-based approaches d) A water activated GO transfer technology using wax printed membranes for fast patterning of sensors as well as for a cost-efficient nanomotor building technology for several applications. This work is supported by EU (Graphene Flagship), CERCA Programme / Generalitat de Catalunya. The ICN2 is supported by the Severo Ochoa Centres of Excellence programme, funded by the Spanish Research Agency (AEI, grant no. SEV-2017-0706).