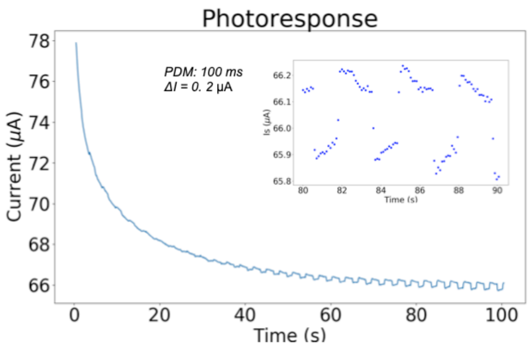
Molecular Junctions for Life Sciences

Developing platforms to bridge the gap between conventional electronics and biotic systems is a major breakthrough. Nevertheless a key element in these studies is still the electrical contact to the electrodes. Here we will discuss two approaches to fabricate both bottom and top electrodes. In a first experiment, our aim is to measure the bioelectrocatalytic activity of a redox enzyme (Lactate Oxidase) [1] immobilized on bottom gold nanoelectrodes [2, 3] to explore dynamic and spatiotemporal aspects of the junction. In a second investigation we test the capability of CVD graphene to contact a Self Assembled Monolayer (SAM) attaining a Molecular Graphene-assisted Field Effect Transistor (mG-FET). Graphene, a debated biocompatible material and alternative to conventional top electrodes in Molecular Electronics, [4] is a good candidate for fast optoelectronic applications because it is transparent, stretchable, with high-gain photodetection and very sensitive to electrostatic perturbation due to its high mobility and 2D character. [5] In this way, electrostatic interactions between quantum dots such as those coming from the redox ferrocenyl undecanethiol molecules in a SAM [6] could be exploited for photodetection.



mG-FET Photoresponse. *Au/Ferrocenyl Undecanethiol//Graphene on top of Si (SiO_2 = 290 nm) wafers operating at V_{BG} = 10 V, V_B = 10 mV, ambient conditions and illumination of 21.5 mW led (Thorlabs MCWHF2).*

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