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Organic electrochemical transistors for sensing applications
FABIO CICOIRA[1], SANG YOON YANG, JOHM A. DEFRANCO, GEORGE G. MALLIARAS, MSE/Cornell University, ORGANIC ELECTRONICS LABRATORY CORNELL TEAM — The application of organic semiconductor devices to chemical and biological sensors seems to be a great fit. A promising approach towards organic-based sensors involves the use of organic electrochemical transistors (OECTs). These devices can be operated in aqueous environment as efficient ion-to-electron converters, thus providing an interface between the worlds of biology and electronics and also a unique platform for the study of organic/organic and organic/metal interfaces in liquids. Using photolithography, surface engineering and micro fluidics we have developed several technique to fabricate OECTs having different geometries. This allows us to study the basic electronic properties and the sensing response of devices in order to understand their mechanism of operation. We studied how the dimensions of the transistors (in particular on the gate/channel area ratio) and the gate electrode material (metal or polymer) can be used to tune the device response for sensing of different species. The effect of the electrolyte on device response was evaluated studying transistors in aqueous electrolytes and ionic liquids. The detection limit of OECTs based sensors having different geometry, was analyzed for hydrogen peroxide, a species involved in glucose sensing.

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