**Organic Electrochemical Transistor (OECT) based Zn2+ biosensor**

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**Abstract**

Organic electronics have been widely used for biological applications [1]. More specifically, organic electrochemical transistors (OECTs) are attracting a lot of attention recently due to their large transconductance that offers high signal to noise ratio (SNR), which makes them great candidates for the detection of weak biological signals. In particular, monitoring ion fluxes through the plasma membrane is highly attractive as it provides important information about the mechanism of different organs which could help finding cure for different diseases such as diabetes [2]. Diabetes are caused by issues with glucose metabolism and insulin regulation by pancreatic islet. Since zinc ions are released with the secretion of insulin by Beta cells of pancreatic islet in response to glucose stimulation, finding a way to monitoring these ions will provide a solution for early detection of diabetes [3].

To this regard, OECT based $Zn^{2+}$ biosensors have been developed. Their fabrication was carried out in the clean room using standard photolithography processes. Then an organic mixed ionic electronic conductor (OMIEC) selective to zinc cations, named p-Tri-DPA was electropolymerized in the channel between the source and drain. The measured electrical characteristics of the OECT show typical p-type polymer based-OECT behavior, with transconductance values in order of mS ($\~2mS)$,comparable to the state of art of OECTs presented in the literature[4]. Subsequently, transient measurements were recorded and demonstrated the sensitivity of these OECTs to zinc cations ($\~1.16x10^{-3} µA/µM $) **(see figure below)**, and their selectivity comparing to other cations such as $Ca^{2+}, Mg^{2+}, K^{+}$. To our knowledge this is the first $Zn^{2+}$ sensor based on OECTs obtained with high sensitivity and selectivity. These results are promising for more development of different ionic based biosensors for future in vivo and in vitro biological applications.

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