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Novel glucose biosensor based on organic thin-film transistors. MARIA NIKOLOU, SEIICHI TAKAMATSU, DANIEL MACAYA, GEORGE MALLIARAS, Department of Materials Science and Engineering Cornell University, Ithaca, NY, GRACIELA BLANCHET, Dupont, Central Research, Wilmington, DE — We report on a novel design of an organic thin-film transistor which utilizes a double channel transistor configuration. This electrochemical sensor-transistor is based on conducting polymers and operates at low voltages. The sensor response is measured as the drain-source current of one channel while a potential is applied on the other channel. The behavior of the transistor can be understood in terms of an electrochemical mechanism which is proven to depend on the ionic concentration of the electrolyte. The possible applications of these devices in biological sensing are explored as the advantages of their use are many, e.g. high sensitivity and selectivity, and low manufacturing cost. We present results from devices exploiting different conducting polymers, e.g. PEDOT:PSS, PANI, on a variety of substrates, e.g. glass, plastic, and demonstrate the capability of this type of device to sense glucose in a neutral pH buffer solution by a mechanism involving sensing of hydrogen peroxide. These devices can also be used effectively in the detection of other biological analytes.

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