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High Transconductance Organic Electrochemical Transistor With Ionic Gel Electrolyte And Its Possible Application As Biosensor. VIKASH KAPHLE, SHIVA BHATTRAI, SHIYI LIU, BJORN LUSSEM, Kent State University — Organic Electrochemical Transistors (OECTs) are seen as a key device for the field of bioelectronics. OECTs operate in aqueous environment and at low voltages, they can be flexible, and they are bio- compatible. Currently, OECTs are mainly used as sensors, e.g. to detect ions, metabolites, hormones, DNA, Dopamine, lactic acid. Furthermore, they are used to record brain activity, the activity of electrically active cells or tissues, or to drive an active matrix display[1][2]. Transconductance is the most important parameter of OECTs as it determines the performance of the device. Here we discuss high transconductance OECTs and their limiting factors[3]. We present OECTs with a transconductance greater than 2 mS and on/off ratios in excess of 10^3 using a room temperature ionic liquid (C2MIM EtSo4) and PBS as electrolyte. This electrolyte can be crosslinked into a solid gel, which is essential to integrate these devices into wearable sensors. We also discuss the origin of gate bias stress and hysteresis effects of this transistor, and propose approaches to minimize these instabilities. Furthermore, possible application of OECTs as a lactate acid sensor and neurotransmitter sensors are evaluated. References [1] X. Strakosas, M. Bongo, **2015**, *41735*, 1. [2] D. Khodagholy, J. Rivnay, M. Sessolo et. al., *Nat. Commun.* **2013**, *4*, 2133. [3] V. Kaphle, S. Liu, A. Al-Shadeedi, C. M. Keum, B. L??ssem, *Adv. Mater.* **2016**, *28*, 8766.

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