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Doped Ambipolar Organic Field-Effect Transistors[1] AKRAM AL-SHADEEDI, SHIYI LIU, SCOTT BUNGE, BJÖRN LÜSSEM, Kent State University — Organic doping leads to significantly improved performance of organic devices such as organic light emitting diodes (OLEDs) and organic solar cells. Doping improves the injection of charge carriers into organic semiconductors and significantly increases the conductivity of organic layers, which allows for the design OLEDs operating at very low voltages and high power efficiency. Doping in organic transistors is more seldom used, but first studies show that it will be highly beneficial here as well. In this contribution, we show for the first time that organic ambipolar transistors can be realized by doping the contact and channel region of organic field-effect transistors (OFETs). The OFETs consist of pentacene as a matrix material, insulating tetratetracontance (TTC) as passivation layer, and Al2O3 as gate oxide. The source and drain regions are doped by the n-dopant W2(hpp)4 to improve carrier injection. Furthermore, the channel region is slightly doped (1wt%) by the same dopant. The results discussed in this contribution open a new approach to design and optimize organic circuits. As an example, the design of an organic inverter consisting of two doped OFETs layers will be discussed and it will be shown that the switching voltage of the inverter can be precisely controlled by the doping ratio in the organic channel.

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