Minority and Majority Currents in Organic Field-Effect Transistors

Akram Al-Shadeedi[1], Shiyi Liu[1], Vikash Kaphle[1], Chang-Min Keum[1], and Björn Lüssem[1]

[1] *Department of Physics, Kent State University, Kent, OH, 44242, USA*

Organic field-effect transistors (OFETs) have the potential to become the basic building block of a flexible electronics technology used e.g. in flexible displays or wearable sensor systems. Doping these transistors can make them not only more reliable and reproducible [Applied Physics Letters **104,** 013507 (2014)], but opens a new perspective on OFETs: For the first time, generation and dynamics of minority and majority currents can be studied in lightly doped films [ACS Appl. Mater. Interfaces **8**, 32432 (2016), Nature communications **4**, 2275 (2013)].

In this presentation, our current understanding of doped OFETs will be discussed [Chem. Rev. **116**, 13714 (2016)]. An emphasis will be placed on p- and n-doped pentacene-based OFETs, and a new model to describe generation of minority charge carriers inside pentacene will be proposed. Furthermore, the working mechanism of an organic depletion type transistor – the organic electrochemical transistor – will be presented and strategies to optimize their performance will be proposed [Advanced Materials Volume **28**, 8766 (2016)] .

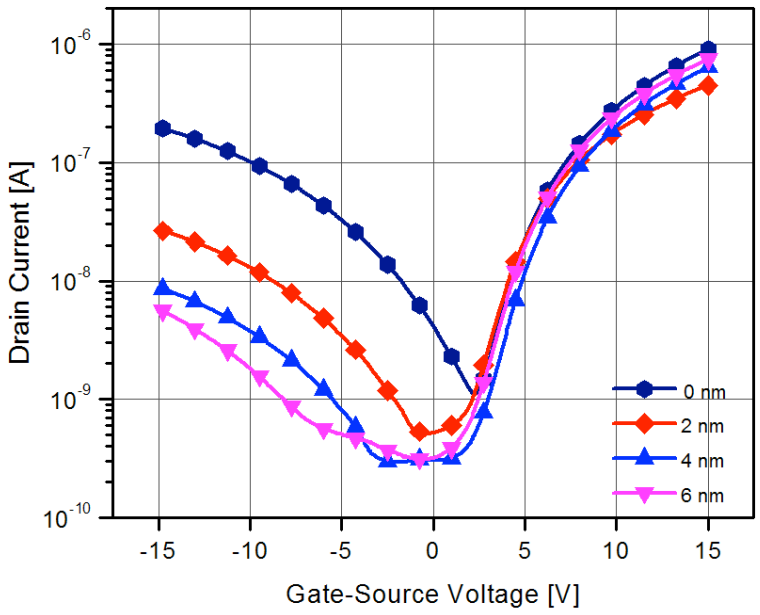

Figure 1: Minority (holes, negative gate voltages) and majority conduction (electrons, positive voltages) in n-doped organic field effect transistors [ACS Appl. Mater. Interfaces **8**, 32432 (2016)].