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## S E M I N A R
## aus
## Halbleiterphysik und Nanotechnologie

**<u>Di, 15.5.2018, 11:00 Uhr</u>,** Hörsaal für Physik

# "The role of interfaces in organic transistors"

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The field of organic electronics is based on the promise that one can utilize organic chemistry to craft molecules tailor-made for a desired application. Owing to the peculiar properties of organic semiconductors, there is rich and unique physics taking place in organic devices. A particular wealth of physics occurs at interfaces, so that the performance of organic devices is critically or even solely determined by effects confined to interfaces. However, it is not straight forward to anticipate to the full extent to which a given interface controls the charge transport in organic devices.

In my opinion, the prediction of the role of an interface in an electronic device poses a challenging problem on multiple length scales. On the molecular length scale, one encounters typically encounters disorder in thin organic semiconducting films. On the other hand, such films are ultrathin (being a few tens nanometer thick), while assuming areas from several $\mu m^2$ (in displays) to $mm^2$ (transistors), or even $cm^2$ (lighting panels and solar cells).

In this seminar, I intent to exemplarily show that we can devise an insightful overarching picture for an entire device by combining the contemporary knowledge, that is available on each length scale. Guided by examples selected from the field of organic transistors [1–4], I will illustrate the interdependence of the electric performance of organic devices on their charge injecting interfaces. I will propose how we can conceptually link our understanding of the experimentally detectable interface properties with the electric current voltage characteristic. Step by step, I will relate (i) the interface properties with the local charge transport and (ii) such local transport phenomena to the operation of the entire transistors. The crucial tools to establish these relations are Kinetic Monte Carlo and drift diffusion-based simulations.

We will put the insight gained by our overarching picture to an application test: Can we extract the contribution from the charge injecting interfaces directly from experimentally obtained current voltage curves?

I will give an outlook on our future endeavors that aim at characterizing transport of particles through paper. In particular the first steps to identify transport pathways from the microstructure will be shown.

**References**

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[3] M. Gruber, E. Zojer, F. Schürrer, K. Zojer, Adv. Funct. Mater., 23, 2941–2952 (2013).
[4] S. K. Possanner, K. Zojer, P. Pacher, E. Zojer, F. Schürrer, Adv. Funct. Mater., 19, 958–967 (2009)