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Electron and hole transport in organic single crystals[1] J. PFLAUM, A.K. TRIPATHI, S. MEYER, 3. Dept. of Physics, University of Stuttgart, 70550 Stuttgart, Germany — Transport measurements reported in literature often classify the semiconducting behavior in organic thin films and single crystals to be whether p-type or n-type. Moreover, the majority of polyaromatic hydrocarbons such as pentacene in combination with technically relevant contact materials such as Au are found to preferentially show hole conductivity. In this presentation, we will discuss these key aspects of the charge carrier transport in case of highly-ordered organic crystals, the latter grown by diferent methods from previously purified material. By time-of-flight spectroscopy it will be demonstrated for various compounds that the chemical purity rather than the growth conditions determine the resulting semiconducting behavior. E.g. anthracene single crystals grown by sublimation provide as good electron as hole mobilities of about 1 cm^2/Vs if the material is purified by zone- refinement. For crystals made of sublimation purified anthracene, no electron transport could be detected. Finally, comparing various structural motifs we will discuss possible concepts of molecular design enabling stability against photooxidation and allowing for the formation of highly-ordered thin films.

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