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Intrinsic Charge Transport in Organic Field-Effect Transistors

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Organic field-effect transistors (OFETs) are essential components of modern electronics. Despite the rapid progress of organic electronics, understanding of fundamental aspects of the charge transport in organic devices is still lacking. Recently, the OFETs based on highly ordered organic crystals have been fabricated with innovative techniques that preserve the high quality of single-crystal organic surfaces. This technological progress facilitated the study of transport mechanisms in organic semiconductors [1-4]. It has been demonstrated that the intrinsic polaronic transport, not dominated by disorder, with a remarkably high mobility of "holes" $\mu = 20$ cm^2/Vs can be achieved in these devices at room temperature [4]. The signatures of the intrinsic polaronic transport are the anisotropy of the carrier mobility and an increase of μ with cooling. These and other aspects of the charge transport in organic single-crystal FETs will be discussed.

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