Polarons in Electrostatically Doped Polymers

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Infrared (IR) and optical methods provide a wealth of information on the nature of the electronic states involved in charge injection and charge transport in organic semiconductors. One important advantage of a spectroscopic approach is that information on the dynamical characteristics of injected charges is obtained through contactless measurements. Recently we have succeeded to carry out spectroscopic studies of organic field effect transistors (OFET) based on polymers and single crystals of rubrene. The optical constants in far-IR frequencies obtained for rubrene-based devices reveal the Drude-like form thus providing the direct support for the hypothesis of band-like transport in rubrene. IR measurements with polarized light uncover the anisotropy of the optical conductivity in qualitative agreement with earlier transport studies. IR microscopy measurements show high uniformity of charge injection over macroscopic length scales extending over several millimeters. I will compare and contrast these new results with the data we have acquired earlier for thin film OFETs.

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