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Spin related magnetic field effects in organic semiconductor devices

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Abstract

Many research efforts are being conducted in organic semiconductors (OSEC) because of their ability to conduct electrical current by π-electrons. Devices based on OSEC are of interest for organic electronics and spintronics due to their low fabrication cost and high flexibility.
We have studied the magnetic field dependence of electro-optical characteristics of OSEC devices, such as electro- and photo-luminescence, electric current, photocurrent, etc.; the devices have been studied in magnetic fields up to 9T and in a temperature range of 4-320K. In this talk, we will describe our studies of magneto-photocurrent (MPC) in organic photovoltaic (OPV) cells and magneto-current (MC) in newly designed vertical organic field effect transistors (VOFET).
In order to better understand our experimental results we propose several spin related mechanisms that describe interactions that affect the spin configuration of pairs of spin ½ positive and negative polarons (holes and electrons). We discuss the following spin-configuration mixing: (a) Hyperfine interaction of polarons and nuclei. The response is limited to fields of the order of the hyperfine field. (b) Δg mechanism that causes singlet-triplet mixing at high fields when the g-factor of the positive and negative polarons are not equal. (c) Thermal spin polarization.

Khachatryan et al. Organic-inorganic proximity effect in the magneto-conductance of vertical organic field effect transistors. Appl. Phys. Lett. 109, 033506 (2016)
Khachatryan et al. Short-lived charge-transfer excitons in organic photovoltaic cells studied by high-field magneto-photocurrent. Nat. Commun. 5:4529 (2014)

ההרצאה תתקיים ביום רביעי, ה-31.8.16 בשעה 12:30

בבניין ננו אלקטרוניקה- זיסאפל, קומת כניסה, חדר 465

The lecture will take place on Wednesday, 31.8.16 at 12:30

at the Zisapel Nanoelectronics Building, entrance floor, room no. 465

Ph.D. Student of Professor Eitan Ehrenfreund