Magnetic field dependence of photocurrent in sexithiophene based field effect transistors

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The singlet fission (SF) effect is a promising solution for overcoming the theoretical upper limit of the quantum efficiency in organic photovoltaics and photodetectors [1-3]. The magnetic field dependence of the photocurrent is used as a detector of the SF based on its unique "M" shape curve [2, 4]. In this work, we investigated the magneto-photocurrent (MPC) of thermally evaporated sexithiophene-based field effect transistors (FETs). The gate voltage dependence of MPC indicated the electrical-field assisted SF in sexithiophene FET. At negative gate bias, the conventional intersystem-crossing-related MPC was observed [5]. At positive gate bias, the MPC responses initially increase and then decrease to form an "M" shape curve, which attributes to the SF effect (Fig.1). In order to confirm the SF, the C_{60} molecule was deposited on top of the sexithiophene-based FET to form a bilayer transistor. In this device, the charge transfer at sexithiophene/C_{60} interface overwhelms the SF effect. Therefore only intersystem-crossing-related MPC was observed as shown in Fig.2.

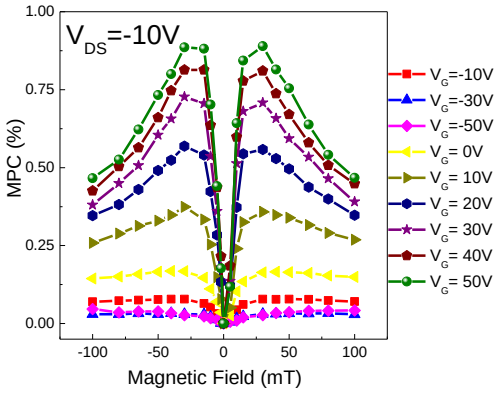

Fig.1. Magnetic field effect on photocurrent of sexithiophene-based field effect transistor.

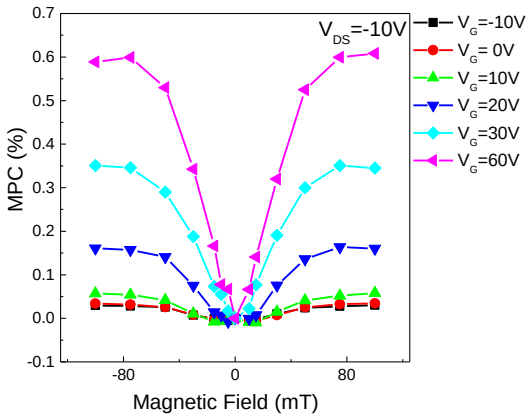

Fig.2. Magnetic field effect on photocurrent of sexithiophene/C_{60} field effect transistor.

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