【別紙２】

論文名：Studies on the Magneto-sensitive Photoelectric Conversion in Organic Semiconductor（要約）

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（以下要約を記入する）

Magnetic field effects (MFEs) on the spin dynamics of the photogenerated carrier and existence of pair states from the photo-irradiation of organic semiconductors (OSCs) offer a vast opportunity to understand the mechanism in the carrier generation and charge transportation in OSCs. In recent years, these OSCs continue to attract the attention of many researchers due to their promising applications and the emerging demands in the fast growing optoelectronics technology. One of the successfully employed methods to clarify the photocarrier dynamics in wide varieties of OSCs such as oligomers, polymers, and organic self-assemblies in their solid states is the time-resolved photoconductivity technique. Thus, in this thesis, the photocarrier dynamics in the films of selected noteworthy semiconducting materials for solar cell applications such as [6,6]-phenyl C_{61} butyric acid methyl ester (PCBM), swallow-tailed perylene bisimide (STPBI), pentacene (Pen) and dipyrrolo[1,2-a:2',1-c]pyrazino[2,3-b]quinoxaline (DPPQ) was investigated on the basis of the MFEs on photoconductance or known as the magnetophotoconductance (MPC).

In the case of PCBM, two distinct MPC curves were observed describing the annealing effect on the photocarrier dynamics in PCBM films. The MPC changes from a positive phase for non-annealed PCBM to a broad negative phase for annealed PCBM at 200°C. It was then concluded that the positive MPC effect (assigned to the electron-hole pair mechanism) in the non-geminate e-h pair, originated from the preferential recombination of the ^{1}e-h pair to the ground singlet state of PCBM (^{1}g). In addition, the negative MPC effect was ascribed to the triplet-doublet (T-D) pair mechanism involving a collision dynamics of a triplet exciton (^{3}ex).

The study on STPBI highlighted the significant role of triplet exciton in T-D mechanism. In terms of the MPC results, it was found that the MPC curves in the films of pure STPBI revealed both non-geminate recombination and T-D mechanism based on the narrow positive and broad negative MPC. These MPC profiles also depended on host matrix and the amount of STPBI dopant. Doping a small amount of STPBI (~10% w/w) in poly(*N*-vinylcarbazole) matrix resulted to the disappearance of the broad MPC curve. This effect was attributed to the possible immobilization of triplet exciton and the reduced interaction with the trapped carrier within the STPBI-PVCz film samples.

Photocarrier dynamics in both Pen and DPPQ revealed no significant contribution of non-geminate recombination. However, the formation dynamics of the triplet exciton in Pen showed significant dependence on the mode in which Pen is dispersed in wide band gap OSC matrix. Spin polarized triplet state was found only in mono-molecularly-doped Pen, and not in microcrystalline Pen films where singlet fission to the triplet state is very effective. In addition, from the MPC profiles in DPPQ films, it was considered that the photocarrier dynamics in DPPQ would likely to follow that of Pen although the possible spin polarization effect in DPPQ used in the study is still unconfirmed.