Structure and Physical Properties of Organic Semiconductors Based on Field Effect Transistor

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Most intriguing properties of C_{60} have been obtained so far by introducing carriers of holes and electrons using the chemical doping methods. In such a case, the quality of the crystals of pristine C_{60} becomes worse due to the defects made during the doping processes. Furthermore, high symmetry of the fcc lattice of C_{60} is distorted, often leading to the loss of superconductivity and ferro-magnetic properties. For instances, some of the C_{60} fullerides prepared by intercalation with alkali ammonium salts show much lower superconducting temperature than the expected T_c values or sometimes do not show any superconductivity, due to the symmetry lowering. In the case of TDAE-C_{60} system, the occurrence of ferromagnetic properties sensitively depends on the little structural difference among the charge transfer salts. Especially, from the mobility of carriers point of view, defects as well as dopant cations and anions become a serious problem in many situations.

Considering the issues raised above, carrier injection by the physical doping using Field Effect Transistors (FET) will be very important to study in the future, although apparent marvelous success does not seem to be achieved at the moment. We have studied the possibility of carrier injection for the thin films of C_{60} and other organic semiconductors fabricated on FET substrates. In this meeting, electronic properties observed will be presented and comparisons as to the FET characteristics will be made. In addition, thin film structure on the FET substrates will be discussed using the X ray diffraction data obtained in the high energy facility of Spring-8.

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