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Carrier injection of electrons and holes by nanostructure surface control in field effect transistors KATSUMI TANIGAKI, AIMR/Department of Physics, Tohoku University, THANGAVEL KANAGASEKARAN, AIMR, Tohoku University, HIDEKAZU SHIMOTANI, Department of Physics, Graduate School of Science, Tohoku University — Carrier injection from metal electrodes to organic charge transfer layers can greatly be improved for both electrons and holes by nanostructural surface control in organic field effect transistors. We demonstrate a stark contrast for a 2,5-bis(4-biphenylyl)bithiophene (BP2T) and rubrene (RU) active semiconducting layer grown on a modified SiO_2 dielectric gate insulator between two different modifications of tetratetracontane and poly(methyl methacrylate) thin films. Important evidence that the field effect transistor (FET) characteristics are independent of electrode metals with different work functions is given by the observation of a conversion of the metal-semiconductor contact from the Schottky limit to the Bardeen limit. Equivalent high efficient carrier injection of both holes and electrons is exemplifed and air-stable light emitting FETs are demonstrated.

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