

Electrical characteristic of poly(3-hexylthiophene) organic thin film transistor with electroplated Ni electrodes on polyimide

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Organic thin film transistors (OTFTs) on flexible substrate using electroplated electrodes have various advantages in the fabrication of low cost sensors, smart cards, and flexible displays. This method can be a competitive candidate for OTFT applications requiring large area coverage, structural flexibility, low temperature processing, and especially low cost. In this work, poly(3-hexylthiophene) (P3HT) organic thin film transistors (OTFTs) were fabricated using (P3HT) as a semiconducting layer and electroplated Ni as a gate electrode. First, since the adhesion of electrodes on the flexible substrate is of great importance for the application in flexible devices. Cu(seed)/Cr(adhesion) layers were sputter-deposited in sequence using DC magnetron sputtering on polyimide substrate. Then, polyimide substrate was patterned by a photolithography for gate electrodes. After photolithography, Ni gate electrodes were electroplated into the patterned SU-8 mask. Electroplating method used both DC and pulsed electroplating. Evaporation of SiO₂ gate dielectrics with a shadow mask, spin-coating of P3HT film, and formation of Au source and drain electrodes by evaporation were followed. The channel length ranged between 10 and 110 μm, and the channel width was 800 μm. Electrical properties of fabricated OTFT were characterized by I-V measurements and the effect of various process conditions and structures on the performances of fabricated devices will be discussed.