## Poly(3-hexylthiophene)/fullerene organic thin-film transistors: Investigation of photoresponse and memory effects

## Abstract

Organic thin-film transistors (OTFTs) incorporating blends of poly(3-hexylthiophene) (P3HT) and [6,6]-phenyl C61-butyric acid methyl ester (PCBM) as an active layer were fabricated, and the photoresponse and memory effects of the P3HT/PCBM-TFTs were investigated. With top source-drain contact, the device exhibited a unipolar property with p-channel characteristics in dark condition. Upon illumination, a significant increase in the drain current was observed, and the transfer curve was shifted in the positive direction with  $\Delta$ Vth = 15:5 V. Moreover, the drain current increased gradually with the response time of light illumination, while it decreased gradually with delay time after turning off the light illumination. The memory effects of the P3HT/PCBM-TFTs were attributed to the slow relaxation of photoinduced charge carriers and the electron trapping-detrapping mechanism. The memory functions of program and erase can be performed using a combination of the optical response and gate voltages. © 2010 The Japan Society of Applied Physics.