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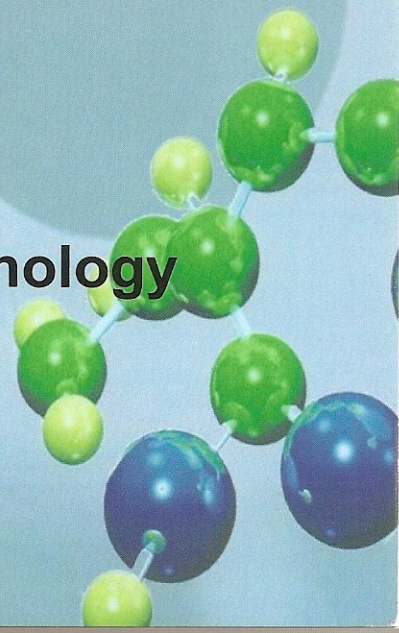


Photo-induced Characteristics of Organic Thin Film Transistors Using Soluble Tips-pentacene

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Photo-induced characteristics of organic thin film transistor (OTFT) devices using poly(alkylthiophene) as an active layer was reported by Narayan *et al.* [1] We fabricated OTFT devices using soluble Tips-pentacene and investigated photo-induced characteristics of the devices (see Fig. 1). Highly doped *p*-type Si wafer and thermally grown SiO₂ layer were used as a gate electrode and dielectric layer, respectively. Using conventional photolithography, gold (Au) source and drain electrodes were patterned with the length and width on the active region as 100 μm and 1500 μm , respectively. The active layer using soluble Tips-pentacene was drop-casted and then annealed at 120°C for 24 h in vacuum oven. In dark condition, the maximum mobility of the Tips-pentacene based OTFT was $\sim 0.13 \text{ cm}^2/\text{Vs}$. Upon irradiation of visible light, the mobility of the OTFT devices slightly increased and the threshold voltage was shifted positively. From the threshold voltage shift, we estimated a photo-induced charge carrier density of the devices. The slow relaxation of the photo-induced charges and charge trapping phenomena at the interface between active and insulating oxide layers could lead to a large hysteresis (see Fig. 2). Using the hysteresis characteristics, a reproducible memory operation [writing-reading (on-state)-erasing-reading (off-state)] was performed.

References

- [1] K. S. Narayan, N. Kumar, *Appl. Phys. Lett.* **79**, 1891 (2001).

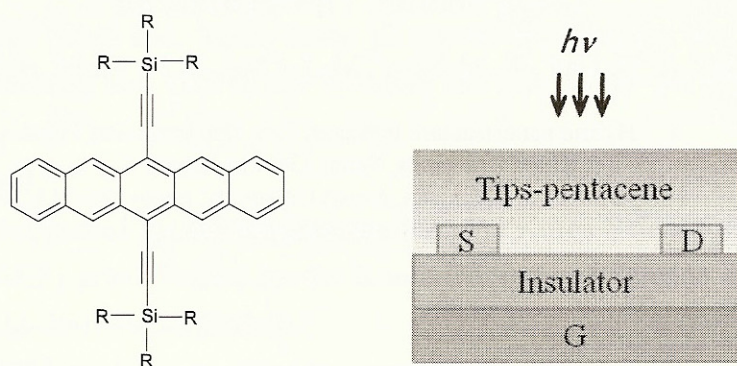


Fig. 1. Chemical structure of Tips-pentacene and schematic diagram of Tips-pentacene based OTFT device

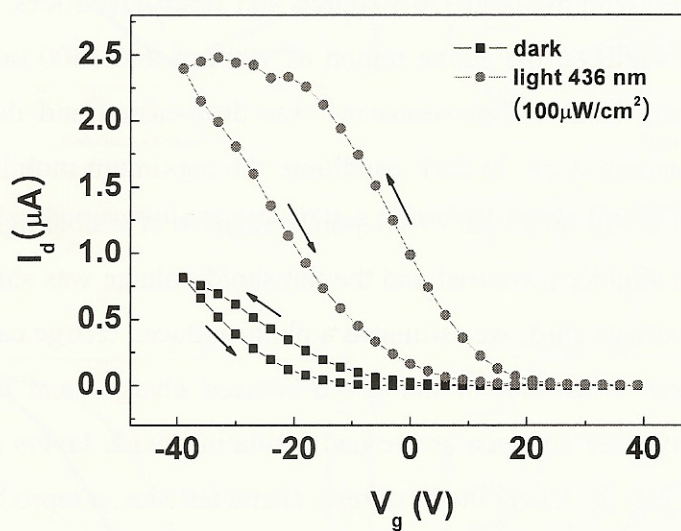


Fig. 2. Hysteresis of Tips-pentacene based OTFT in dark and light conditions