

Photoelectric Properties in Oriented Films of Poly(3-dodecylthiophene) and Possibilities in Application to Organic Solar Cells

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Polyalkylthiophene (PAT), a pi-conjugated one-dimensional polymer, is one of the useful conductive polymer, which is feasible for organic solar cells and thin layer transistors.¹ PAT has the regioregularity to give good orientation of main chain² and to show the anisotropy of photoelectric properties by rubbing or stretching of these conductive polymers.³ In this study, we used a regioregular poly(3-dodecylthiophene) (P3DT) for the purpose of the controlling of photoelectric properties of P3DT. A study of photoelectric properties in oriented forms of P3DT and non-oriented films was carried out on polarized optical absorption (Fig. 1), polarized photoluminescence (PL), dark current-voltage (I-V) measurement, steady-state photoconductivity measurement, transient photoconductivity (TPC), and time-of-flight (TOF) measurement.

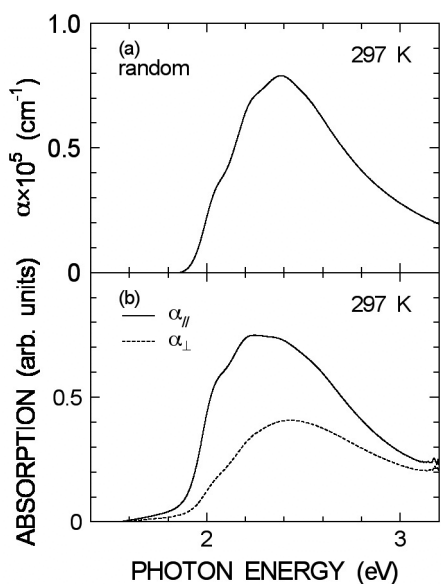


Fig. 1(a) Optical absorption spectrum in a non-oriented film of P3DT and (b) polarized optical absorption spectra in oriented films of P3DT.

It was found that the direction of P3DT is in the rubbing one and the increase in the dark dc (Fig. 2) and photoconductivity (Fig. 3), and in the drift mobility of the oriented film of P3DT was observed. A control of the chain configuration and an improvement of the carrier transport property might give a great possibilities in application to the organic solar cells.

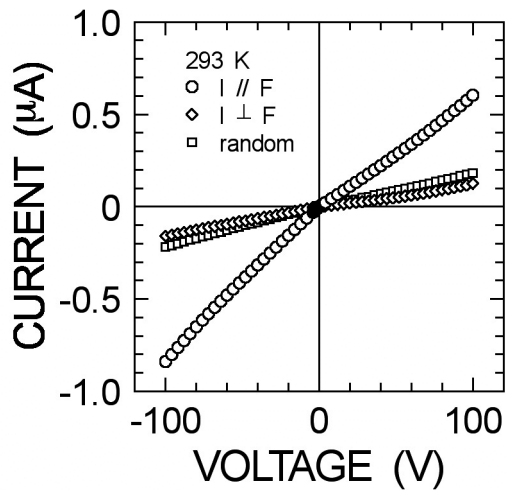


Fig. 2. Dark current-Voltage measurements in non-oriented and oriented P3DT films.

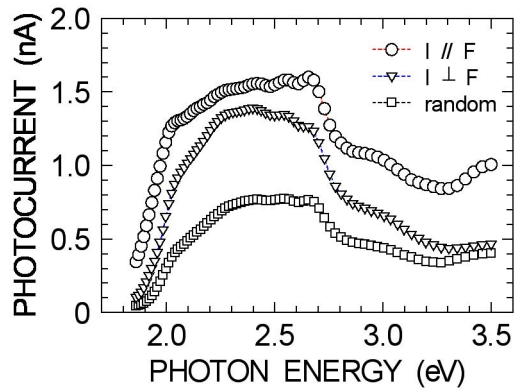


Fig. 3. Photoconductivity spectra in non-oriented and oriented films of P3DT.

References

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