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Carrier mobility is one of the most important parameters for charge transport in semiconductors. The higher mobility gives better device performances, because the current density in the device is proportional to the carrier mobility. In the present study, we developed an instrument to investigate time-of-flight transient photocurrent of organic/inorganic semiconductor materials (Fig. 1) and measured the hole mobility of Poly[[[(2-ethylhexyl)oxy]methoxy-1,4-phenylene]- 1,2-ethenediyl] (MEH-PPV) thin films. MEH-PPV is a conjugated polymer known as a hole transport material [1-2] and have been recently used for organic optoelectronic devices [3].

The MEH-PPV film was prepared by dropping chlorobenzene solution onto an ITO-coated glass substrate. The film was dried for 8 h by conducting the E-cast, which was a drying process of the cast film under vertical electric field against the film. Then, the film was annealed for 2 h and aluminum for an electrode was deposited by thermal evaporation in a high vacuum.

By E-cast, the mobility was increased by a factor of 3. Further, annealing at around the glass transition temperature, T_g , increased the mobility by a factor of 3.7, as shown in Figure 2. Consequently, the mobility was enhanced to a factor of 10 by both the E-cast and annealing processes and its magnitude became 2×10^{-5} cm^2/Vs . This is the greatest value in previously reported hole mobilities of pure MEH-PPV films. The polymer film of enhanced hole mobility will be useful for hole transport material of organic optoelectronic devices.

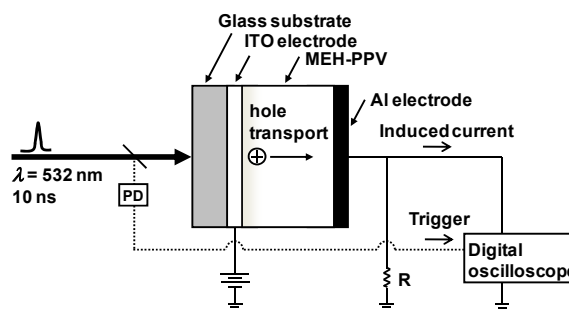


Fig. 1. A schematic diagram of developed instrument to measure time-of-flight photocurrent of semiconductor materials.

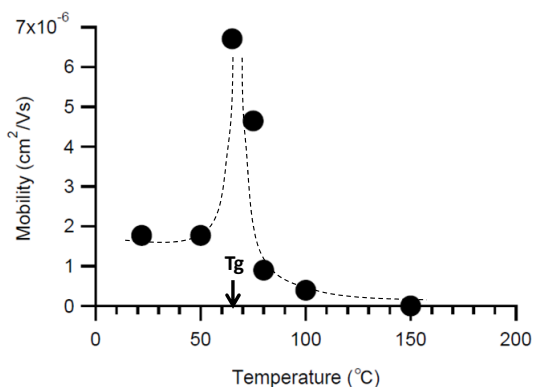


Fig. 2. Annealing effect on hole mobility of MEH-PPV film. T_g represents the glass transition temperature.

References:

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