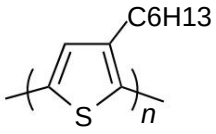
Organic semiconductor thin film evaluation using SDI Corporation's micro dip coater

Thin film and transistor elements were fabricated and evaluated using polythiophene, a standard polymer-type organic semiconductor.

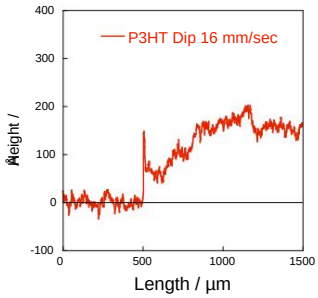
Material: P3HT (poly-3-hexylthiophene) Solvent:
Chloroform Concentration:
5 g/L Substrate:
Si/SiO2

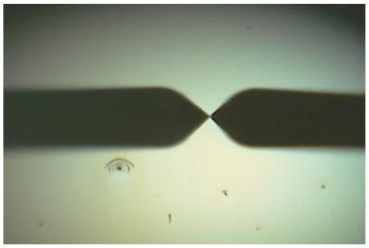


Thin film preparation

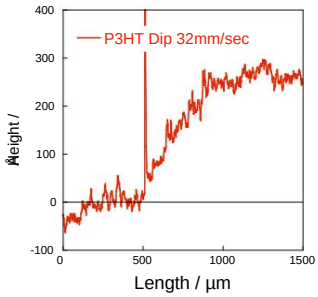
A thin film was produced by dipping the film in the polymer solution for 5 seconds and then pulling it up. Pulling speeds of 8, 16, 24 and 32 mm/s were tested. As previously known, the faster the pulling speed, the thicker the film. Looking at the photo below, the film produced at 32 mm/s appears to have more unevenness on the surface than the one produced at 16 mm/s. However, the film thickness measurement chart does not appear to show any particular unevenness. A high-quality thin film was obtained, similar to conventional spin-coated films.

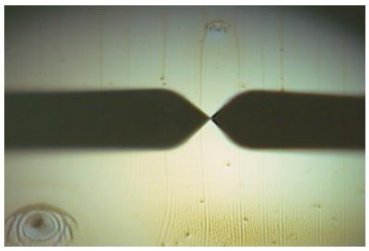
ÿ Pulling speed 16 mm/s (dip time 5 seconds): 125~150 Å



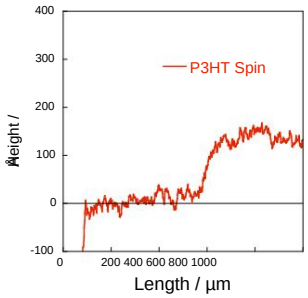


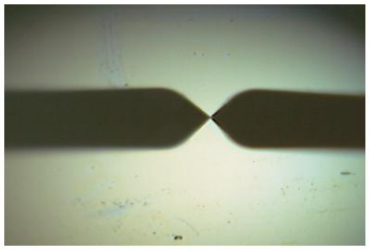
ÿ Pulling speed 32 mm/s (dip time 5 seconds): 200~260 Å





ÿ Spin coating (2000 rpm, 30 s): 100~120 Å





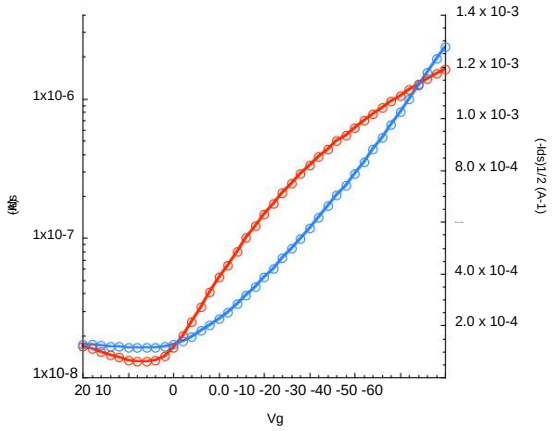
Transistor characteristics

A transistor was fabricated and evaluated using the above thin film. No difference was observed in the transistor characteristics due to the pulling speed or film thickness (all of which are believed to be within the margin of error). In addition, the transistor performance was equivalent to that of a spin-coated film.

Dip-coated film: 2~4×10-3 cm2 /Vs

Spin-coated film: 2~3×10-3 cm2 /Vs

ÿ Dip coat (32mm/s)



ÿ Spin coat (2000rpm, 30s)