TRANSFORM

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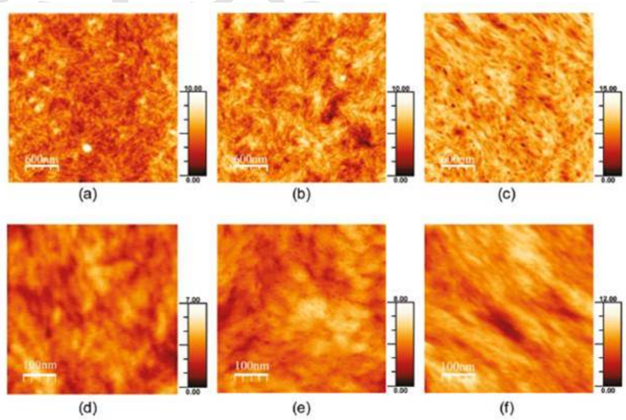

IMPROVING ORGANIC THIN-FILM TRANSISTORS

Yuning Li

Organic thin-film transistors (OTFTs) have plenty of advantages over their traditional, silicon-based counterparts. These carbon-based semiconductors are cheaper. They're flexible. They're lightweight. But when it comes to the main measure of performance - charge carrier mobility - they still lag behind.

The problem lies in the poorly organized molecular structure of organic semiconductors. Treating the thin-film transistor with high-temperatures can address this, but it's expensive and time-consuming.

UW's Yuning Li and his colleagues are taking a different approach. They're incorporating fused ring-shaped donor-acceptor structures into the semiconductors to strengthen the forces between neighbouring molecules.

Among several novel semiconductors the researchers have developed using this strategy, one of the most promising is PDQT. This easy-to-synthesize polymer spontaneously arranges itself into stacks that facilitate the movement of charge carriers.

OTFTs fabricated from PDQT can achieve hole mobility values of up to 0.89 cm2/(V.s) without the need for high-temperature processing. Meanwhile, because PDQT contains a long, branched side chain, it can be dissolved in various solvents. This makes it easy to print PDQT into OTFT circuits and arrays for a wide range of electronic appliances.

Partners: Institute of Materials Research and Engineering, the Agency for Science, Technology and Research, Singapore.