OPTOELECTRONICS

Mixed-up organics show best of both worlds

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Credit: ANSTO

Organic solar cells have potential as power sources for soft, wearable electronics due to their flexibility. However, the typical method of increasing the conversion efficiency — using an active layer with higher crystallinity and hence higher charge mobility — imposes limits on mechanical robustness. Kenjiro Fukuda, Takao Someya and colleagues have now developed a high-performing acceptor layer that avoids an excessively crystalline phase, allowing solar cells that are both efficient and flexible.

The researchers — who are based at the University of Tokyo, RIKEN, Monash University and the Australian Synchrotron — used a polymer donor and an organic (non-fullerene) acceptor. They then mixed a small amount of fullerene, which has a high charge mobility but tends to form brittle crystalline phases, with the acceptor. The resulting acceptor exhibited good electronic properties while retaining a largely amorphous phase. The solar cells, which are only 3 μm thick, have a conversion efficiency of 12.3%, and can maintain 97% of this value after 1,000 bending cycles and 89% after 1,000 compression–stretching cycles.

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