New polymeric material brings companies one step closer to cheaper plastic solar cells and electronics

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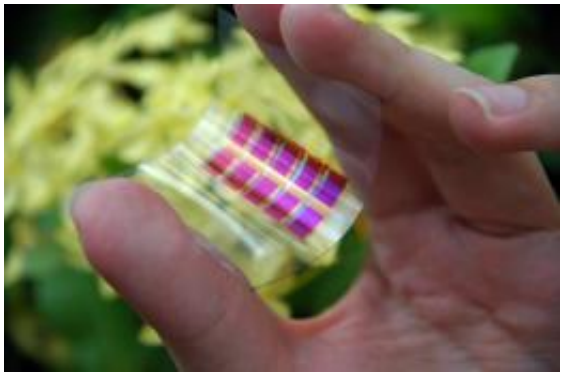


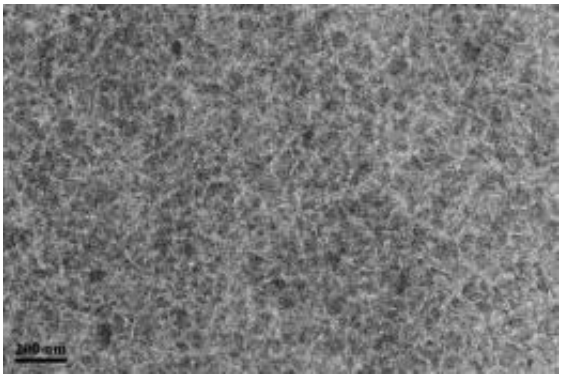
Flexible, organic solar cells - IMRE’s polymer can help save costs and resources in making devices like organic solar cells and next generation printed circuits on plastic. Credit: Agency for Science, Technology and Research (A*STAR)

A single polymer that can be used in both new age plastic electronics as well as plastic solar cells could spell greater cost-savings and open up new design options for electronic and solar cell companies. A*STAR's IMRE has developed a new polymer that not only produces a high charge mobility of 0.2 cm2/V.s, which is the same value achieved by commercially available semiconducting materials but also has a high solar power conversion efficiency of 6.3%. This makes IMRE's polymer one of the few that has both these properties. In addition to this, polymers of the same class as IMRE's, which are those that use thiophene and benzothiadiazole as the building blocks, could only achieve 2.2% power conversion.

"Current polymers are usually good in one aspect or another, either as a good conductor for use in electronics or endowed with high power conversion efficiency - but not both", said IMRE Senior Scientist, Dr. Chen Zhi Kuan, the principal researcher working on the polymers. "IMRE's polymer functions not only as a good material to make electronic components, the same material can be used to convert sunlight to electricity efficiently". The polymer can also be easily applied in roll-to-roll printing techniques which is similar to how newspapers are currently printed making it possible to manufacture large area-scale printed electronics and organic solar cells quickly and cheaply.

With IMRE's polymer, manufacturers could save cost using just a single bulk resource for making both printed electronics and organic solar cells. The material could also possibly be used in designing new devices where both power harnessing and electronics are needed in a single component. An example of this would be chemical sensors based on organic thin-film transistors and powered by organic solar cells.

"This breakthrough will help speed up the development of plastic electronics and organic solar cells, and make them more readily available in the marketplace," said Prof Andy Hor, Executive Director of IMRE.



IMRE’s polymer has both high charge mobility and high power conversion efficiency in a single material as

opposed to most polymers that have either one or the other, not both - A transmission electron microscopy image of the IMRE polymer, PC71BM film, showing phase separation between the polymer fibres (light) and PC71BM (dark). Credit: Agency for Science, Technology and Research (A*STAR)

Printed electronics often rely on organic materials like polymers that can be easily processed and manufactured as opposed to traditional electronics (or metal electronics) which rely on inorganics such as copper or silicon. The polymers can be made into thinner, lighter and cost-effective electronic components and organic solar cells.

The IMRE team is developing other organic materials-based polymers that can be scaled up to production and integrated easily into organic electronics. These materials can be used to make energy harvesting and low-power consumption devices like low-cost organic solar cells, new flexible display devices, next generation smart labels and RFID tags.

The research and results were recently published in *Advanced Materials*.

Provided by Agency for Science, Technology and Research (A*STAR)