

# Cheaper and easier way found to make plastic semiconductors

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Cheap, flexible and sustainable plastic semiconductors will soon be a reality thanks to a breakthrough by chemists at the University of Waterloo.

Professor Derek Schipper and his team at Waterloo have developed a way to make conjugated polymers, plastics that conduct electricity like metals, using a simple dehydration reaction the only byproduct of which is water.

"Nature has been using this reaction for billions of years and industry more than a hundred," said Schipper, a professor of Chemistry and a Canada Research Chair in Organic Material Synthesis. "It's one of the cheapest and most environmentally friendly reactions for producing plastics."

Schipper and his team have successfully applied this reaction to create poly(hetero)arenes, one of the most studied classes of conjugated polymers which have been used to make lightweight, low- cost electronics such as solar cells, LED displays, and chemical and biochemical sensors.

Dehydration is a common method to make polymers, a chain of repeating molecules or monomers that link up like a train. Nature uses the dehydration reaction to make complex sugars from glucose, as well as proteins and other biological building blocks such as cellulose. Plastics manufacturers use it to make everything from nylon to polyester,

cheaply and in mind-boggling bulk.

"Synthesis has been a long-standing problem in this field," said Schipper. "A dehydration method such as ours will streamline the entire process from discovery of new derivatives to commercial product development. Better still, the [reaction](#) proceeds relatively fast and at room temperature."

Conjugated polymers were first discovered by Alan Heeger, Alan McDonald, and Hideki Shirakawa in the late 1970s, eventually earning them the Nobel Prize in Chemistry in 2000.

Researchers and engineers quickly discovered several new [polymer](#) classes with plenty of commercial applications, including a semiconducting version of the material; but progress has stalled in reaching markets in large part because conjugated polymers are so hard to make. The multi-step reactions often involve expensive catalysts and produce environmentally harmful waste products.

Schipper and his team are continuing to perfect the technique while also working on developing [dehydration](#) synthesis methods for other classes of conjugated polymers. The results of their research so far appeared recently in the journal *Chemistry - A European Journal*.

Provided by University of Waterloo

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