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Carbon-Dioxide Plastic Gets Funding

A startup is moving ahead with an efficient method to make biodegradable plastic.

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Affordable, biodegradable plastics made from carbon dioxide are moving closer to market. Novomer (http://www.novomer.com/) , based in Ithaca, NY, which is developing the plastics, has received $6.6 million in venture-capital funding. Novomer, which was founded in 2004, plans to use the investment to scale up its manufacturing capacity.

The Cornell University spinoff's technology centers on a catalyst that converts carbon dioxide into a polymer that could be used to make everyday items such as packaging, cups, and forks. The plastic, which was originally created by Cornell chemist Geoffrey Coates, is also safe and strong enough to be used in medical implants and devices. (See "1999 Young Innovator (http://www.technologyreview.com/tr35/Profile.aspx?Cand=T&TRID=543) .") The plastic should be relatively inexpensive since carbon dioxide is a cheap feedstock, says Coates (http://www.chem.cornell.edu/faculty/index.asp?fac=21) .

The plastic is being made on a pilot scale, and Novomer declines to give details of its commercial-scale manufacturing plans. Novomer president Charles Hamilton says that, while it is hard to predict the product's final cost, it should be cost competitive with traditional petroleum-based plastics.

Researchers first found a way to make biodegradable plastics called aliphatic polycarbonates from carbon dioxide in 1969. They used carbon dioxide and a class of compounds called epoxides. But the process requires expensive catalysts, high temperatures, and pressure. The plastic costs more than $100 a pound and is used only in specialty products such as biomedical and electronic devices.

Novomer uses the same raw materials--carbon dioxide and epoxides--but its product is distinguished by a metallic catalyst developed by Coates. The zinc-based catalyst works at room temperature and low pressure, and it's faster. "Our reaction takes a matter of minutes," Coates says. "So we can use a lot less of the catalyst."

The polymer has different properties--it can be hard, soft, transparent, or opaque--based on the type of epoxide used. It is also biodegradable, since the carbon-oxygen bonds in Novomer's polymer are relatively easy for bacteria to break down. Coates says that Novomer has not tested the degradability of the polymer, but aliphatic polycarbonates in general have been shown to degrade in six months in composts under ideal conditions.

In terms of biodegradability, the Novomer plastic will have to compete with several other plant-based plastics now on the market, including ones made by Metabolix (http://www.metabolix.com/) , based in Cambridge, MA, and NatureWorks (http://www.natureworksllc.com/) , based in Minnetonka, MN. But Coates says that Novomer's use of carbon dioxide and carbon monoxide as inexpensive feedstocks, instead of the corn-based feedstocks used by other biodegradable plastics, means that the company's plastic won't compete with food production.