

# Could two Georgia companies help solve the plastic crisis?

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Credit: Unsplash/CC0 Public Domain

A time-lapse video shows a baby blue straw sitting in a tank of water and rocks.

Not much happens at first, as a counter of days zips from 1 to 24. But by Day 25, layers of the [straw](#) begin to peel away. As the counter reaches Day 43, holes line the sides before the straw breaks apart on Day 45. About two weeks later—on Day 58—the straw is gone.

If this were a conventional plastic straw, it could take 1,000 years to break down, one expert said.

But the straw in the video, and appearing at Mercedes-Benz Stadium and restaurants such as Dunkin' Donuts, is made from a biodegradable compound called Nodax that's patented by Georgia-based Danimer Scientific. A metro Atlanta company turns Nodax into a product it calls Phade—pronounced "fade"—that's designed to look and feel like a regular plastic straw.

Single-use plastics made from petrochemicals dominate packaging in the U.S. in part because of their low cost and convenience. But they're polluting the planet and contributing to climate change.

Businesses and scientists have worked for years to find [alternative materials](#) that are commercially viable and that function like plastics that consumers already use. Investors are reportedly plowing hundreds of millions of dollars globally into finding alternatives.

Nodax, derived from canola oil, comes from a growing family of bioplastics called polyhydroxyalkanoates, or PHAs.

Stone Mountain-based WinCup, which buys Nodax and forms it into drink stirrers and straws with the brand name Phade, touts it as a revolutionary breakthrough to tackle plastic pollution.

Each year, millions of metric tons of plastic enter the oceans, which WinCup CEO Brad Laporte said is one of the most difficult

environments for plastics to biodegrade.

"So when you see that video of it breaking down in the ocean, or in that case in a fish tank, that's really the Holy Grail," Laporte said.

But the plastic pollution crisis is complicated.

Conventional plastic straws have garnered massive attention on social media and in the news, but plastic and foam abound. Plastic water and soda bottles are ubiquitous. Most potato chip bags are made of plastic. Some paper coffee cups are lined with a thin plastic layer to prevent leaks.

Atlanta-based Coca-Cola, long a punching bag for environmentalists, has doubled-down on recycling, including some bottles sourced from plants. The company has pledged to collect for recycling the equivalent of every bottle it sells by 2030, despite lagging recycling rates.

Experts said materials like Nodax and products like Phade are steps toward solving the problem, but there could be limitations to their ability to biodegrade, and Nodax may not have the right characteristics to replace all disposable plastic items. Costs to bring production up to scale could be high, they said.

A straw isn't the most demanding item in terms of function, said Alfredo Alexander-Katz, professor of materials science and engineering at Massachusetts Institute of Technology. It only needs to withstand cold liquids for a few hours at most. A takeout container, on the other hand, needs to withstand foods of various weights and temperatures and must hold those foods for days.

Still, the biodegradable PHA products and other alternative bioplastics could help fill in pieces of a very complex environmental

puzzle—particularly if they can replace larger [single-use plastics](#).

Products that use Nodax, like the Phade straw, seek to tackle plastic in ways recycling alone can't solve. Many plastics like straws can't be recycled, and for those that can, most don't end up where they should. In 2018, manufacturers produced 35.7 million metric tons of plastic in the U.S., but that was only recycled at a rate of about 9%, according to an analysis from the U.S. Environmental Protection Agency.

If they're not recycled, plastics end up in landfills, incinerators and the environment, where they can wash into waterways and end up in the ocean. Scientists have raised concerns about the prevalence of microplastics.

Phade and other products made of Nodax, however, can be composted. During this process of biodegradation, microbes consume the polymer as food and leave behind [organic products](#) such as carbon dioxide.

Phade straws and stirrers have certifications from standardized tests for industrial compostability from Biodegradable Products Institute and TÜV Austria, leading testing and certification bodies. For home compostability, the products have a certification from TÜV Austria. As for marine biodegradation, WinCup said Phade passed tests from Organic Waste Systems laboratory in Belgium.

Carson Meredith, a professor and the executive director of the Renewable Bioproducts Institute at Georgia Tech, focuses on creating new biodegradable food packaging products in his research. He said the 60-day mark for the straw in the Phade video "seems reasonable," but that the contents of the tank are unknown—they may not represent a true ocean environment. The certification tests are a more reliable basis for the straw's ability to break down because they are standardized and widely accepted.

According to the website for Phade products, the straw biodegraded in a marine lab test by 90% in just 98 days, much faster than the 180 days required to pass its biodegradability test. Variation in the ocean happens, but it's hard to know without testing exactly how variation would affect the time it takes for the straw to break down, Meredith said.

A typical plastic straw is made of polypropylene, which could last 1,000 years.

## **Scaling up**

Mitchell Anthamatten, chair of the chemical engineering department at the University of Rochester, said these products aren't "a slam dunk," and ultimately, consumer buy-in is vital.

Plus, the cost of PHAs is higher, at least for now. A 50-count pack of 7.75-inch Phade straws is \$7.89 direct from WinCup, while a 500-count pack of typical straws on Amazon is about \$10.

"I think there's a lot of risk ... Can they actually get a commercial product out that is marketable?" Anthamatten wondered.

So far, Danimer and WinCup have struck deal after deal with big brands.

Danimer has a deal with liquor giant Bacardi to replace 80 million conventional plastic bottles annually with Nodax-based liquor bottles starting in 2023.

A Dunkin' Donuts representative said it has expanded testing of the Phade straw to more than 900 restaurants following a smaller pilot from 2020. Restaurant chain First Watch announced a deal for the straw in early August. It uses about 30 million plastic straws a year, but they will soon be replaced by Phade.

"In the short term, it's definitely going to be a more expensive item," said Joe Grubbs, Danimer's senior director of research and development. "But the idea is that as we continue to grow and we continue to expand, that's going to be a driving factor to reduce costs."

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