

# Baked goods could become bioplastics

September 17 2012, by John Platt

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That day-old Starbucks croissant may not need to go into the garbage after all. A new technique developed by Carol S. K. Lin, a biochemical engineer at the City University of Hong Kong, could turn uneaten pastries and coffee grounds into chemicals which could be used to formulate bioplastics and other substances. Lin presented her research team's findings in August at the 244th national meeting of the American Chemical Society (ACS).

"Our new process addresses the [food waste](#) problem by turning Starbucks trash into treasure - detergent ingredients and bioplastics that can be incorporated into other useful products," Lin said in a news release issued by the ACS.

Lin and her research team had already been developing the tools to do this when they were first approached by the nonprofit The Climate Group, which has formed a coalition of public and private partners to try to develop what their website refers to as a "low carbon future." One of the Climate Group's corporate partners is Starbucks Hong Kong, which was seeking new ways to reduce the amount of waste generated by its stores.

The group approached Lin's team because they were already developing biorefinery technology. As the ACS press release puts it, "biorefineries convert corn, [sugar cane](#) and other plant-based material into a range of ingredients for bio-based fuels and other products."

In this case, the process developed at Lin's lab blended the old [baked](#)

[goods](#) with a mix of enzyme-secreting [fungi](#). Those fungi, in turn, broke down the carbohydrates in the foods back into [simple sugars](#). From there, the sugars went into a fermenter. There they were exposed to bacteria which now had the job of breaking the sugar into succinic acid, a colorless, odorless substance that is heavily used in the food industry as a [sweetener](#) but can also be used in the production of a wide variety of materials, including medicines, bioplastics and even [laundry detergent](#). The U.S. Department of Energy considers succinic acid to be a valuable commodity since it can be refined with less energy than petroleum. The salts from succinic acid are also effective in coolants and are less toxic than other cooling chemicals.

Putting the bakery goods and [coffee grounds](#) through a biorefining process would also have the added benefit of keeping a lot of waste out of the waste stream while also reducing pollution from incineration. According to the ACS, Starbucks Hong Kong produces nearly 10 million pounds of spent coffee grounds annually. Starbucks Hong Kong helped Lin's research by donating the spent coffee grounds and unsold bakery items as well as money generated by the sale of a gift set of "Care for Our Planet Cookies." The campaign generated about \$6,400 for the research efforts, Lin told GE's Ecomagination.

Lin said that the biorefinery process could be used for all kinds of food waste and could be commercialized on a large scale with additional funding from investors, according to the ACS press release. Meanwhile, her lab has funding from the Hong Kong government and has applied to set up a "pilot-scale lab" in Germany.

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