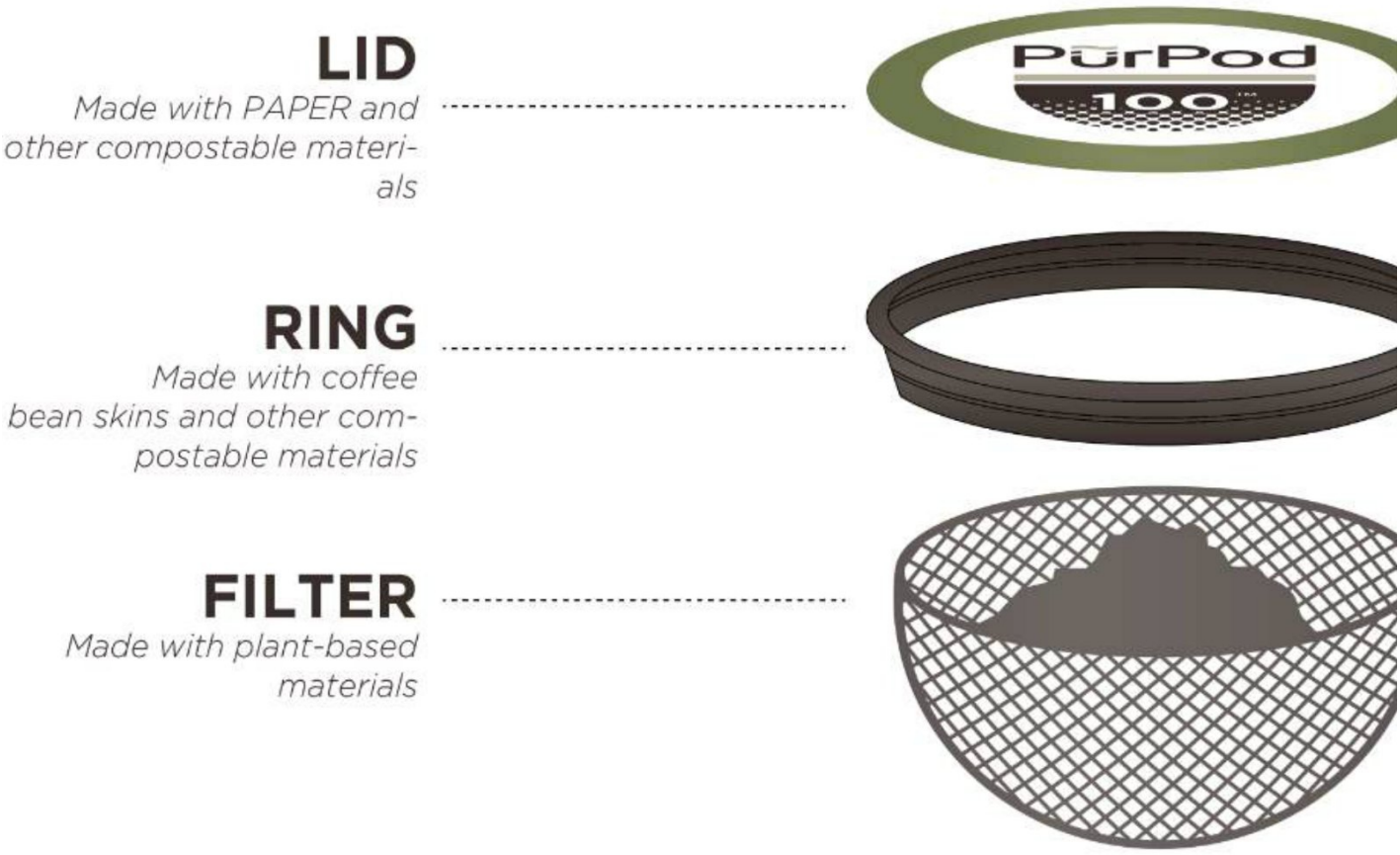
Serving A Better Cup Of Coffee

University of Guelph



In recent years, the popularity of single-serve coffee makers has increased dramatically. The handy appliances — commonplace in many homes, office break rooms and hotels — provide convenience for consumers, but at a high cost to the environment

The single-serve pods used by these machines generate enormous amounts of waste. Such concerns prompted officials in Hamburg, Germany to ban the purchase of single-serve pods for government buildings. But elsewhere, sales flourish and the pods usually end up in landfills. One estimate suggests that the volume of pods sold each year for one of the most popular brands — the Keurig K-Cup — could circle the globe more than 10 times. Because of that massive waste problem, the K-Cup's inventor has said publicly that he sometimes regrets his creation.

Thanks to researchers at University of Guelph, there's a much more earth-friendly coffee pod available now— one that's not only compostable, but also incorporates material that coffee roasters would often haul to landfills.

By 2011, Canada's largest supermarket chain, Loblaws, realized that although consumers loved single-serve coffee,

they didn't love the idea of creating so much waste. Loblaws turned to its supplier, Club Coffee, to identify someone who could create a compostable coffee pod. After two years, Club Coffee still couldn't find a solution — so the CEO asked Ontario's deputy minister of agriculture if she knew anyone who might help.

That led to a meeting in January 2014, where Club Coffee explained its predicament to Amar Mohanty, Ph.D., director of University of Guelph's Bioproducts Discovery and Development Centre. Atul Bali, CEO of Competitive Green Technologies, also attended that meeting. He and Mohanty had worked together on previous projects to commercialize university technologies, and they shared an overarching goal: reduce the world's dependence on petroleum-based plastics by developing bio-based materials made with natural fibers or fillers.

To develop the compostable coffee pod, the biggest challenge was creating the bio-material for the ring that secures the coffee pod's pouch. That's because Mohanty needed to design something that was compostable and cost-effective. At the time, Club Coffee's pods had rings made from polypropylene, a petroleum-based plastic that costs significantly less than typical bio-degradable plastic. "People are very interested in being green, but they aren't interested in paying more," says Mohanty, who has studied bio-polymers for more than 25 years. To create a ring that didn't exceed Club Coffee's cost requirements, Mohanty knew he would need to add an inexpensive natural fiber to the bio-degradable plastic. He wasn't sure which fiber he would use — but the material would have to be readily available in large quantities.

After about four months of talking with companies in the coffee industry, Mohanty found his answer. He learned that before coffee beans are roasted, the skin of the bean is removed. It's called chaff, and coffee roasters consider it a waste product. They pay companies to haul chaff away and spread it in fields, dump it in landfills, or burn it. When Mohanty heard that, something clicked. "If I see something going to waste, my mind starts wondering, 'How can I utilize that?'"

With coffee chaff, Mohanty had an ideal inexpensive natural fiber. The coffee roasters were glad to have their chaff hauled away for free, so Mohanty and his researchers could use it. By September 2014, he had a ring formulation with bio-degradable plastic that consisted of about 25 percent chaff. That allowed Mohanty to reduce the cost sufficiently. What's more, chaff represented a natural fiber that wouldn't encounter supply shortages. It's an important consideration, since supply-chain problems often create big hurdles for bio-based composite materials. Within Canada and the United States alone, Mohanty estimates that roasters produce more than 10 million pounds of chaff each year. His approach has the added benefit of finding value in discarded industrial material. As Bali puts it: "The use of chaff is totally ideal from a waste management perspective — turning waste to value."

In March 2015, University of Guelph's Catalyst Centre filed a patent on Mohanty's innovation and exclusively licensed the technology to Competitive Green Technologies in June 2015. It took less than a month to negotiate that license, says Steve De Brabandere, associate director for the University of Guelph's Catalyst Centre. "We've done four licensing agreements with them, and we anticipate doing more in the future."

> *Says Mohanty: "The [Catalyst Centre] was instrumental in making this project a great success. The support we received in commercializing the technology is essential in a project like this. It improves the patenting process and the licensing agreement."*

De Brabandere observes that Mohanty's formulation creates a virtuous circle — it helps keep chaff out of landfills and that chaff allows cost-effective production of compostable pods. He's also struck by the close working relationship between Mohanty's research center and Bali's company, Competitive Green Technologies. It played a critical role in the commercialization of the formulation, he says. "For anything like this, it's not the type of technology where you make it in a lab and then throw it over the wall," says De Brabandere. "It's not like we've developed a pharmaceutical drug that isn't going to change." Instead, it requires plenty of willingness to tweak.

Bali agrees. "When you prepare a new material in a laboratory, maybe you use four pounds of it in experiments," he says. "When you now take that to the real world, the customer is looking for a trial run of 1,000 pounds to put in big molding machines." That can entail considerable changes to fit real-life manufacturing conditions.

When Mohanty's formulation first ran through a large molding machine, it didn't work properly, says Bali. "But we did three iterations and by the third time, we nailed it." By November 2015, Competitive Green Technologies was able to use a mold that produced 64 of the rings every 10 seconds. "Right now, the molder is molding half million rings a day," says Bali.

The compostable coffee pod that includes the ring is called PurPod100 — it's a Club Coffee product that is now supplied to large retailers in Canada and the United States, including Loblaws, Kroger, Walmart and Costco. When the Biodegradable Polymer Institute tested the PurPod100 to provide compostable certification, it found that the pod was 100 percent composted in about 45 days. Without the help of several researchers at his center, Mohanty notes that it would have taken much longer to develop the compostable pod. "For this type of product, one person might be able to do it in three or four years if they work very hard," says Mohanty. "Our team of researchers was able to complete this in less than 18 months."

The single-serve coffee maker at his research center uses the compostable pods — but don't expect Mohanty to make beverages with those. He's an avid tea drinker, and one of his next projects involves developing a compostable single-serve pod for tea (it won't include coffee chaff, because the coffee odor would permeate the tea).

"I'm a nature loving guy," says Mohanty. "We are trying to save the world from greenhouse gases — so anything I do, I try to focus on being more environmentally friendly."

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