A recently developed catalyst for breaking down plastics continues to advance plastic upcycling processes. In 2020, a team of researchers led by Ames Laboratory scientists developed the first processive inorganic catalyst to deconstruct polyolefin plastics into molecules that can be used to create more valuable products. Now, the team has developed and validated a strategy to speed up the transformation without sacrificing desirable products.

The catalyst was originally designed by Wenyu Huang, a scientist at Ames Lab. It consists of platinum particles supported on a solid silica core and surrounded by a silica shell with uniform pores that provide access to catalytic sites. The overall amount of platinum needed is quite small, which is important because of platinum's high cost and limited supply. During deconstruction experiments, the long polymer chains thread into the pores and contact the catalytic sites, and then the chains are broken into smaller sized pieces that are no longer plastic material (see image for more details).

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make a more active catalyst that would chew up the polymer even faster, while using catalyst structural parameters to dial in specific product chain lengths," he said.

Huang explained that this type of larger molecule reactivity in porous catalysts in general are not widely studied. So, the research is important for understanding the fundamental science as well as how it performs for upcycling plastics.

"We really need to further understand the system because we're still learning new things every day. We are exploring other parameters that we can tune to further increase the production rate and shift the product distribution," said Huang. "So there are a lot of new things in our list waiting for us to discover."

This research is further discussed in the paper "Size-Controlled Nanoparticles Embedded in a Mesoporous Architecture Leading to Efficient and Selective Hydrogenolysis of Polyolefins," published in the Journal of the American Chemical Society.


**Provided by Ames Laboratory**