



# Catalytic Upcycling Of Hydrocarbon Polymers To High Value Unsaturated Compounds

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## BACKGROUND

New disposal and recycling methods are critical to solving the world’s plastic waste epidemic. Chemical recycling methods such as pyrolysis can be part of the solution, but they fall short in terms of the quality of the output, and the energy expense in heating materials above 500°C. Catalytic approaches can improve the selectivity and energy efficiency of pyrolytic methods, but they still produce low value liquids and gases, and they suffer from low catalyst stability during high temperature operation. A catalytic approach that is capable of upcycling petrochemical-derived plastics would be a suitable solution for this fundamental issue.

## DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a catalytic plastic upcycling method that can be performed at moderate temperatures (250°C to 400°C) with high selectivity. The output of this process can be commercialized as high-quality liquids or used as surfactant precursors. The selectivity for the high-value unsaturated compounds was estimated to be as high as 75% in isolated liquid/wax product and more than 50% by total mass. These materials have a higher value than the waste material from which they are derived and are widely used as surfactants, lubricants, refrigeration fluids, insulating oils, and ultra-low sulfur heavy diesel fuels, many of which are conventionally synthesized via energy-intensive and costly catalytic processes which generate hazardous waste.

## ADVANTAGES

- ▶ Moderate temperature process
- ▶ Drastically reduced energy expense
- ▶ High selectivity
- ▶ Upcycling plastic waste

## APPLICATIONS

- ▶ Petrochemical plants
- ▶ Material production facilities

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	<a href="#">20230279194</a>	09/07/2023	2020-072

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## OTHER INFORMATION

### KEYWORDS

catalytic, upcycling, plastic,  
  
polymer, high selectivity,  
  
petrochemical

### CATEGORIZED AS

- ▶ [Materials & Chemicals](#)
- ▶ [Chemicals](#)
- ▶ [Other](#)
- ▶ [Polymers](#)

### RELATED CASES

2020-072-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- [Efficient and Selective Upcycling of Polyethylene to Alkylbenzenes under Moderate Hydrogen Pressure](#)

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