

# A Thermostable Lipase for PU Degradation

Tech ID: 34552 / UC Case 2026-360-0

## ABSTRACT

Researchers at the University of California, Davis have developed an engineered thermostable lipase capable of efficiently degrading polyurethane plastics at elevated temperatures.

## FULL DESCRIPTION

This technology involves an engineered lipase enzyme with enhanced urethane hydrolysis activity designed to degrade polyurethane (PU), a commonly used plastic polymer. The lipase is genetically modified to contain specific mutations that increase its thermostability, allowing it to operate efficiently at temperatures of 55°C and above, which improves the enzymatic degradation of PU.

The invention covers multiple lipase enzymes, including variants that are optimally active at approximately 65°C as well as others near 80°C.

The engineered lipase exhibits amino acid changes relative to a wild-type enzyme (SEQ ID NO: 1), with variants possessing broader sequence diversity and multiple specific mutations enhancing stability and activity. The technology also includes polynucleotides encoding these lipases, as well as vectors and engineered microbial cells, such as *Escherichia coli*, that express these enzymes. This innovation addresses plastic waste by enabling more efficient, enzyme-driven recycling and biodegradation processes, reducing environmental pollution through improved plastic waste management.

## APPLICATIONS

- ▶ Industrial enzymatic recycling and biodegradation of polyurethane materials.
- ▶ Waste management solutions targeting plastic pollution reduction.
- ▶ Production of environmentally sustainable plastic monomers through enzymatic depolymerization.
- ▶ Biocatalyst development for chemical and materials industries.
- ▶ Integration in engineered microbial systems for large-scale plastic waste treatment.

## FEATURES/BENEFITS

- ▶ Increases thermostability, enabling enzyme function at temperatures above 60°C.
- ▶ Improves polyurethane degradation through efficient urethane hydrolysis.
- ▶ Offers versatile engineered variants with multiple mutations for optimized performance.
- ▶ Enables scalable production by expression in engineered microbial hosts.
- ▶ Supports environmentally friendly plastic waste recycling and biodegradation.
- ▶ Overcomes the resistance of polyurethane plastics to natural biodegradation.
- ▶ Addresses the high chemical stability and complex recycling challenges of polyurethane waste.

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## OTHER INFORMATION

### KEYWORDS

biodegradation,  
engineered enzyme,  
lipase, plastic recycling,  
polyurethane, recycling  
technology,  
thermostability, waste  
management, waste-to-  
resource, wastewater  
treatment

### CATEGORIZED AS

- ▶ **Biotechnology**
  - ▶ Industrial/ Energy
- ▶ **Environment**
  - ▶ Remediation
- ▶ **Materials & Chemicals**
  - ▶ Biological

- ▶ Reduces energy use and costs associated with conventional recycling methods.
- ▶ Boosts recycling rates, decreasing landfill accumulation and pollution.
- ▶ Enhances enzymatic degradation efficiency at higher temperatures, improving recycling viability.

▶ [Polymers](#)

▶ **Research Tools**

▶ [Protein Synthesis](#)

#### RELATED CASES

2026-360-0

## PATENT STATUS

Patent Pending

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