

NEAR COMPLETE DEPOLYMERIZATION OF POLYESTERS WITH NANO-DISPERSED ENZYMES

Tech ID: 32365 / UC Case 2021-155-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20240026114	01/25/2024	2021-155

Additional Patents Pending

BRIEF DESCRIPTION

As global plastic pollution intensifies, the accumulation of microplastics from partial degradation remains a critical environmental threat. To address this, researchers at UC Berkeley have developed a system for the programmable and complete depolymerization of polyesters. By incorporating a nanoscopic dispersion of enzymes directly into the plastic matrix, the technology exploits specific enzyme active sites and enzyme-protectant interactions to ensure processive degradation. This method ensures that the polymer is broken down entirely into its constituent monomers, preventing the formation of persistent microplastics that typically result from traditional degradation processes.

SUGGESTED USES

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Biodegradable Packaging: Developing single-use plastics that undergo rapid and complete degradation in composting environments.

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Textile Recycling: Integrating enzymes into synthetic fibers to facilitate the recovery of monomers from discarded clothing.

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Sustainable Consumer Goods: Manufacturing durable plastic products with a built-in, "programmable" end-of-life trigger.

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Agricultural Films: Creating mulch films for farming that can be tilled into the soil and fully degraded without leaving toxic residues.

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Waste Stream Management: Enhancing industrial recycling processes by using embedded enzymes to selectively break down specific polyester components in mixed waste.

ADVANTAGES

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Microplastic Prevention: Unlike conventional biodegradable plastics, this system achieves near-total depolymerization, avoiding the creation of harmful micro- and nanoplastics.

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Controllable Degradation: The trigger for degradation can be precisely tuned by managing the interactions between the enzymes and their protective additives.

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Broad Substrate Range: Demonstrates expanded selectivity, allowing for the effective breakdown of diverse polyester types that are often resistant to enzymatic action.

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High Enzyme Stability: Nanoscopic dispersion protects enzyme activity during the high-temperature processes required for plastic manufacturing.

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Process Efficiency: Provides a high-yield recovery of monomers, supporting a truly circular economy for plastic materials.

RELATED MATERIALS

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

» **Biotechnology**

» Industrial/ Energy

» **Environment**

» Remediation

» **Materials & Chemicals**

» Nanomaterials

» Polymers

RELATED CASES

2021-155-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Bioactive Plastics With Programmable Degradation And Microplastic Elimination
- ▶ Synergistic Enzyme Mixtures to Realize Near-Complete Depolymerization in Blends
- ▶ Self-Assembled Concentric Nanoparticle Rings To Generate Orbital Angular Momentum
- ▶ Thermal Stabilization Of Embedded Proteins
- ▶ Population-Based Heteropolymer Design To Mimic Protein Mixtures In Biological Fluids
- ▶ Preserving Protein Function Via Statistically Random Heteropolymers



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