Category: **Chemical and Material Sciences**

**Recyclable Plastic Using Superglue**

Closed-Loop Recycling of Scalable Plastics

**Problem Statement**

Plastic waste is a growing environmental challenge, with traditional recycling methods proving to be inefficient and degrading polymer quality. The concept of closed-loop recycling, where polymers can be depolymerized and repolymerized without loss of quality, is gaining traction as a sustainable solution. However, most existing closed-loop recyclable plastics are not commercially viable, limiting their widespread adoption.

**Technology Overview**

This invention presents a novel closed-loop recyclable polymer and plastic based on ethyl cyanoacrylate, commonly known as Super Glue. Unlike other recyclable plastics, this polymer can be produced at an industrial scale using commercially available monomers. The developed process allows the plastic to be depolymerized back into monomers under mild conditions, which can then be repurified and used to create new polymers. The resulting material shares similar properties with polystyrene, Plastic #6 (PS), one of the most widely used plastics, making it a strong candidate for replacement.

**Applications:**

* Replacement for polystyrene in packaging, insulation, and other products.
* Eco-friendly alternatives in consumer goods where polystyrene is currently used.
* Specialty foams for packaging, especially where biodegradability is required.
* Could serve as replacements for rigid PVC, in some applications.

**Benefits:**

The plastic is non-toxic and environmentally degradable. Additionally, the monomer is derived from non-oil-based starting materials, further enhancing the environmental benefits of this technology.

* Closed-Loop Recycling: Enables complete recycling of the plastic into its original monomers without loss of quality.
* Eco-Friendly: Non-toxic and biodegradable, reducing environmental impact.
* Scalable Production: Utilizes commercially available monomers, making it feasible for large-scale industrial applications.
* Polystyrene Alternative: Similar mechanical properties to polystyrene, making it suitable for a wide range of applications.
* Versatile Applications: Can also be used to produce foams for packaging peanuts and other uses.



Contact us about this technology:

Office of Technology Transfer

[techtransfer@boisestate.edu](mailto:techtransfer@boisestate.edu)

(208) 426-5765

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Working Prototype

Inventor

[Scott Phillips, PhD](https://www.boisestate.edu/coen-materials/directory/scott-phillips-ph-d/)