Mechanocatalytic Depolymerization of Plastics

Not all types of plastic can be recycled and can be a costly process

Conventional methods of polymer chemical recycling such as hydrolysis, alcoholysis, and glycolysis are common and frequently used to recycle plastics. Although these conventional methods are effective, these systems require harsh reaction conditions and a large excess of liquids solvents or reagents and can thus be inconvenient due to high economic costs, low productivity, the need for complicated separation steps, and resistance to contaminants found in the used plastics.

Researchers at the Georgia Institute of Technology have developed a new method of chemical recycling of synthetic polymers and plastics that lessens the amount of waste produced and materials required, by creating a process where plastics are broken down simultaneously by mechanical and catalytic forces.

New process limits wastes and materials necessary while increasing recycling ability

This invention is a new process created for the chemical recycling of synthetic polymers and plastics through depolymerization, or the breaking down of polymers. This process works using two components: (1) the use of mechanical ball mills and/or extruders to grind down used plastics and (2) the introduction of a catalyst and suitable reactants to chemically break down the polymers. The ball mills also provide the energy required for the chemical reactions, allow for intimate contact between the reactants and catalysts, and reduce the total amount of reactants necessary.

Summary Bullets

- A new process for recycling plastics has been created where plastics are broken down simultaneously by mechanical and catalytical forces.
- This chemical recycling has less economic costs, produces less wastes, and allows for an increase in the number of different types of plastics that can be recycled.
- The process also provides a convenient solution as it is highly scalable, requires less volumes of catalysts, and can be fueled by electronic and renewable energies.

Solution Advantages

- Limits waste formation and reduces amount of solvents necessary.
- Increases the number of different plastic types that can be recycled.
- Highly scalable process and can operate using electrical and renewable energies.

Potential Commercial Applications

- Conversion of waste plastics to new materials
- Creation of chemical products
- Creation of recycled plastic products
- Construction of fuels and other precursors

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IP Status

The following patent application has published and additional international coverage is pending : WO2021168402A1

Publications

Stages and Kinetics of Mechanochemical Depolymerization of Poly(ethylene terephthalate) with Sodium Hydroxide, American Chemical Society: Sustainable Chemistry and Engineering - 2022

Images

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