Using the power of microwaves to recycle plastics

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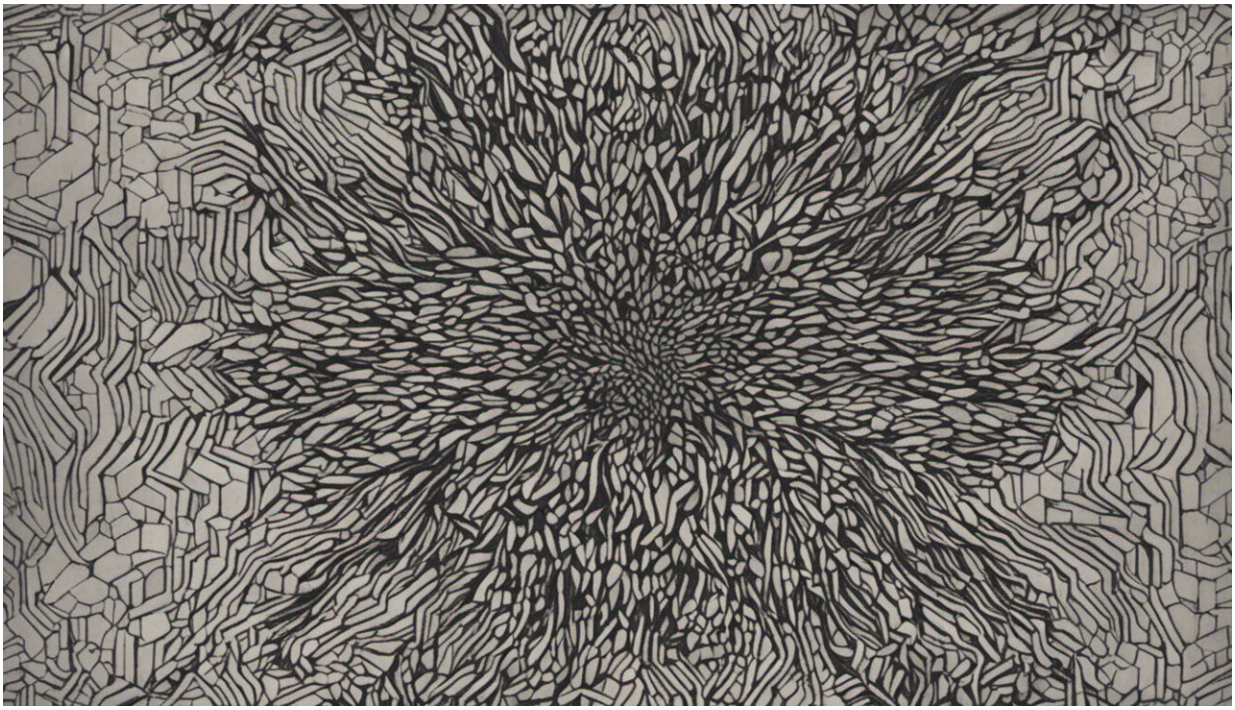

Credit: AI-generated image (disclaimer)

Despite continued efforts to reduce plastic waste, only a fraction of it is recycled. For example, less than 30 percent of plastic waste is recycled in the EU. Some of it is exported to non-EU countries for treatment. The rest goes to landfill or is incinerated, or ends up on beaches, in forests, rivers and seas.

To address this challenge, the EU-funded DEMETO project has been testing a new technology to provide a sustainable, clean, safe and profitable alternative to treat PET/polyester plastic waste. PET refers to a general-purpose thermoplastic polymer that is widely used in packaging and clothing industries.

In a news item by project partner Technical University of Denmark, Associate Professor Ioannis V. Skiadas says: "By combining new microwave technology with a well-known chemical reaction, a unique process has been created that allows us to recycle PET in a way that is economically efficient and to use the recycling method industrially."

Chemical recycling

Unlike the widely used method of mechanical recycling that involves separation of the polymer from its contaminants and reprocessing it to granules via mechanical means, DEMETO focuses on the chemical treatment of PET. Developed through the EU-funded SYMBIOPTIMA project, DEMETO's patented microwave radiation technology and associated chemical process involves disassembling polymers to collect their constituent building blocks for reuse as virgin-grade material in plastics production. Virgin, or prime plastic, refers to newly extracted plastic that has never been used or processed before.

A project brochure notes that the DEMETO method "uses an alkaline hydrolysis as depolymerization reaction." The DEMETO depolymerization technique was developed by project partner gr3n, which also participated in SYMBIOPTIMA.

The project website states: "The adoption of microwave radiations as energetic catalyzer allows DEMETO to reduce reaction time and the complexity of the purification steps of PTA [purified terephthalic acid], while increasing productivity through a continuous process (instead of

the batch ones typical of the industrial state-of-the-art)."

The "indefinite life" of PET

The project website adds that "DEMETO's recycling technology will provide an indefinite life to PET, allowing [it] to come back to its composing elements (Ethylene Glycol, EG, and Terephtalic Acid, PTA) without degrading the materials and, consequently, paving the way for a disruptive, large-scale circular economy for plastic products."

A major benefit of the project will be the reduction in the environmental footprint of PET production and usage. "Thanks to the depolymerization process the post consuming PET can be seen as an alternative to oil and gas," as noted on the gr3n website. This is because "the building blocks for the new virgin PET comes from garbage" rather than fossil resources.

The 3-year DEMETO (Modular, scalable and high-performance DE-polymerization by MicrowavE TechnolOgy) project is scheduled to end in 2020. Project partners hope their technology will be applied to different forms of plastic, including fibers such as nylon or polyester that are used in carpets and textiles.

More information: DEMETO project website: www.demeto.eu/

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