Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

ALKALINE HYDROLYSIS: HIGH YIELD PET RECOVERY

Unlock maximum value from PET waste, direct monomer production for next-generation packaging and products.

Overview

The global PET synthesis rate in 2023 was >800 kg s^{-1} and this is set to increase. It follows that future chemical PET recycling methodologies will need to be rapid, efficient and sustainable. Prof. Stephen Connon's patented alkaline hydrolysis methodology leverages a combination of simple ammonium ion-based phase transfer catalysts and boiling point elevation to depolymerise PET waste from beverage bottles in as little as 4 min at atmospheric pressure without requiring microwaves or cosolvents. This unprecedentedly fast process dramatically reduces energy use and waste-generation relative to existing alkaline hydrolysis methods. A catalyst-free variant is also possible - yielding quantitative yields of terephthalate in 15 min.

Market Opportunity

Global demand for recycled PET is expanding, with governments mandating recycled content in packaging.

High-yield PET recovery positions adopters to meet circular economy targets while reducing operational costs.

Direct TPA production creates cost advantages for downstream manufacturers.

Strategic fit for packaging, textiles, and industrial plastic producers seeking next-generation recycling solutions.

Advantages

Up to 99% recovery of terephthalic acid (TPA).

Direct monomer production – eliminates costly purification steps.

Processes complex feedstocks – handles multi-layer and contaminated PET better than mechanical recycling.

Adaptable process – also applicable to polycarbonate (PC) and mixed PET/PC streams.

Applications

Beverage bottles – rapid, high-yield recovery from post-consumer packaging.

Food packaging – sustainable closed-loop recycling.

Industrial-scale recycling plants – scalable pathway to pure terephthalic acid (TPA).

Why It Outperforms Alternatives

Ultra-fast process – PET depolymerisation in as little as 4 minutes at atmospheric pressure.

No high-pressure systems – simple, scalable operation compared to conventional hydrolysis.

Comparable to microwave-assisted rates – without requiring expensive cosolvents or irradiation.

Lower operating costs – reduced chemical and water consumption.

Technology Status

Proven at multigram scale with quantitative TPA yields.

Compatible with industrial scale-up; requires corrosion-resistant equipment.

Ready for integration into existing chemical recycling infrastructures.

Approx. **TRL 4–5** (lab validation with scale-up potential).

Technology Sector
Chemical Recycling
Industrial Processing

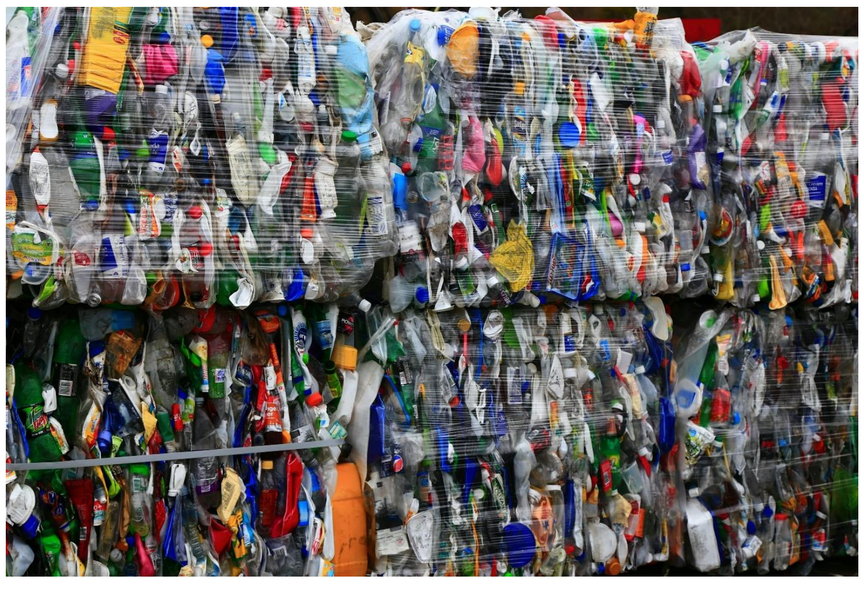
Patent Details
PCT filed in July 2025

Opportunity
Research collaboration
Available to License

Publications

'Catalytic alkaline hydrolysis of PET and BPA-PC waste in minutes at atmospheric pressure without microwaves or organic solvents ', A. Jain and S. J. Connon*, *Green Chem*. **2025**, *27*, 4986.

'Effect of phase transfer catalyst structure on the alkaline hydrolysis of poly(ethylene terephthalate)', L. B. Anderson, C. Molloy, L. Pedrini, I. L. Martin and S. J. Connon*, *Green Chem*. **2024**, *26,* 11125.



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