

# Biological Recycling

A new solution to the plastic waste problem?



## What is it?

- Biological recycling utilises **biologically-derived enzymes as catalysts** for breaking down waste plastic.
- The first **industrially viable plastic-degrading enzyme** was isolated in 2016 from the bacteria *Ideonella sakaiensis*, and was named **PETase** due to its ability to degrade Polyethylene terephthalate (PET).
- The first industrial process utilising a PETase was demonstrated in 2020 by Carbios, where **a PET plastic bottle was fully recycled**.

- Biological recycling would require **less energy** than current mechanical recycling methods, due to **lower temperatures** and **less intensive processes**.
- **Mechanical recycling** is referred to as **downcycling** as it **damages the plastic** and only allows it to be used for **lower value products** once recycled.
- **Biological recycling does not damage the integrity of the plastic** and items could be recycled as many times as necessary.

## Vs. Mechanical Recycling

## Vs. Chemical Recycling

- Biological recycling will be conducted at **lower temperatures (~70°C)**, requiring **less energy** compared with chemical recycling (**180°C+**).
- Biological recycling uses **enzymes as catalysts, removing the need for expensive, rare, or harmful chemical catalysts**.
- Biological processes typically take place in water, **removing the need for harmful or toxic solvents**.

### Sources:

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