

Selective Depolymerization of poly(ethylene terephthalate) in Mixed Plastic Waste Using Magnetically Recoverable nZVI Catalyst

A team of researchers from the Department of Chemistry at IIT Bhilai - Priyank Sinha, Sudipta Paul, Swarup Maity, and Dr. Sanjib Banerjee has unveiled groundbreaking research addressing one of the most pressing environmental issues of our time: plastic pollution. Polyethylene terephthalate (PET), a common plastic found in bottles, textiles, and packaging, accumulates in landfills and oceans at alarming rates, taking centuries to degrade. Current mechanical recycling methods often downcycle the material or lead to quality loss, while chemical methods are energy-intensive and generate secondary pollution. To combat this growing crisis, the IIT Bhilai team has developed a novel and environmentally friendly method for the chemical recycling of PET transforming waste into high-value monomers using a recyclable nanocatalyst under mild conditions.

Their innovative approach utilizes magnetically recyclable nano zero-valent iron (nZVI) to efficiently depolymerize PET into its monomeric building block, BHET (bis(2-hydroxyethyl) terephthalate), with high selectivity and yield. This method not only allows the recovery and reuse of the catalyst multiple times without loss of activity but also minimizes hazardous byproducts offering a scalable pathway toward closed-loop plastic recycling.

This transformative work, supported by DSIR-CRTDH, Government of India, and IIT Bhilai, demonstrates how nanotechnology and green chemistry can combine to provide real-world solutions to plastic waste management. The study has been published in the prestigious journal ACS Environmental Science & Technology and marks a significant step toward a smarter, cleaner, and more sustainable future.

The article can be accessed through the following link: <https://pubs.acs.org/doi/10.1021/acs.est.5c06820>

