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(57) Abstract :

The present invention relates to the development of genetically engineered microorganisms designed for the efficient biodegradation of plastic waste. This innovative approach addresses the growing environmental challenge posed by plastic pollution by utilizing microbial strains, such as *Escherichia coli* and *Pseudomonas putida*, genetically modified to express plastic-degrading enzymes like PETase and MHETase. These enzymes accelerate the breakdown of synthetic plastics, including polyethylene (PE) and polyethylene terephthalate (PET), into environmentally benign byproducts such as carbon dioxide and water. The microorganisms are further optimized through directed evolution and metabolic engineering to enhance enzyme activity, stability, and byproduct utilization. This technology offers a scalable, eco-friendly solution for plastic waste management, applicable in industrial waste treatment plants, landfills, and polluted natural environments. The invention promises significant advancements in reducing plastic pollution and promoting sustainable environmental practices.

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