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(57) Abstract :

This invention relates to an engineered microbial system designed for efficient biodegradation of environmental pollutants, including plastics, heavy metals, and persistent organic compounds. Using advanced genetic modifications, the system enhances pollutant-degrading enzyme production and optimizes metabolic pathways, enabling rapid decomposition under diverse conditions such as high toxicity, low oxygen, and variable pH levels. The engineered microbes can form biofilms for improved pollutant interaction and include genetic containment mechanisms to prevent unintended spread. This sustainable and scalable bioremediation approach offers a highly effective solution for pollution control in soil, water, and industrial waste environments.

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