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(57) Abstract :
Abstract: This invention introduces a novel system utilizing catalytic nanoparticles to enhance the biodegradation of organic pollutants in water and soil. By integrating advanced nanotechnology with microbial degradation processes, the system accelerates the breakdown of recalcitrant pollutants into simpler, non-toxic compounds. The catalytic nanoparticles are designed for stability, reusability, and environmental compatibility, operating effectively across diverse conditions and minimizing secondary pollution. The invention is adaptable to various industrial and environmental contexts, including wastewater treatment, soil remediation, and groundwater restoration. It significantly reduces treatment time and costs while ensuring compliance with stringent environmental regulations. With applications in industries like textiles, pharmaceuticals, and agriculture, this system addresses global pollution challenges, contributing to cleaner ecosystems, public health protection, and sustainable resource management. The invention represents a transformative solution for organic pollutant removal, aligning with principles of green chemistry and advancing global environmental sustainability goals

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