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Bioremediation Approaches for Industrial Effluents †

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Abstract: Environmental contamination due to anthropogenic and natural sources is increasing daily because of the increase in human population, industrialization, and urbanization. Various chemical pollutants discharged by the industries can upset the balance of the ecosystem. Bioremediation is the use of microorganisms and plants to remediate the polluted environment and possess the potential to restore the above disturbing balance. Bioremediation approaches include various types of mechanisms leading to pollutant's mineralization, partial transformation, humification, and alteration in the redox state of pollutants. The basis of the above approaches is the use of extracellular enzymes or cell-free enzymes. Biodegradation and its application in the bioremediation of organic pollutants have benefited from microbial processes' biochemical and molecular studies. Bioremediation has both strengths and certain limitations too. Remediation, achieved together with biological, chemical, or a combination of both means, appears to be the only solution to the problem of pollution without transferring it into the future. The bioremediation approaches y in their complexities and utilities depending upon the type of pollutants, ; thus a better understanding of the principles and the limitations of respective methods is necessary to maximize the benefits andminimize the cost of treatments.

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Conflicts of Interest

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