

Degradation of cycloalkanes and n-alkanes in the water phase of biotrickling filter systems



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(Mrs. Felicia Windler)

DEGRADATION OF CYCLOALKANES AND N-ALKANES IN THE WATER PHASE OF BIOTRICKLING FILTER SYSTEMS

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DIV Deutscher Industrieverlag Dez 2015, 2015. Taschenbuch. Book Condition: Neu. 211x157x9 mm. Neuware - Cyclohexane is a highly volatile and colorless cyclic alkane mainly produced by hydrogenation of benzene. Cyclohexane can be widespread in the environment through petroleum and fuel spills. The United States Environmental Protection Agency (US EPA, 1994) reported several environmental issues related to gas emissions containing cyclohexane. Moreover, the toxicity of cyclohexane is related to its octanol-water partition coefficient (log KOW) with a value of 3.44 causing high cell damage. The saturated cyclic structure of cyclohexane makes it more recalcitrant compared to alkanes or monoaromatic compounds. In this study, two strains capable of degrading cyclohexane were isolated from the soil and sludge of the wastewater treatment plant of University of Stuttgart and from a biotrickling filter system. The strains were classified as gram-negative and identified as *Acidovorax* sp. CHX100 and *Chelatococcus* sp. CHX1100. Both strains demonstrated the capability to degrade cycloalkanes (C5 - C8), while only the strain CHX1100 was able to use short n-alkanes (C5 - C8) as a sole source of carbon and energy. Growth of *Acidovorax* sp. CHX100 using cyclohexane was much faster compared to *Chelatococcus* sp. CHX1100. The strains were able to degrade 99.5 % of 7.5 mM cyclohexane in minimal medium. The results demonstrated the potential applicability of *Acidovorax* sp. CHX100 and *Chelatococcus* sp. CHX1100 for the treatment of waste gas containing cycloalkanes (C5 - C8) and other recalcitrant compounds. The research determined the complete pathway for cyclohexane degradation through mutagenesis, gene expression, induction studies, genome analysis, and analysis of metabolites. Transposon mutagenesis of *Acidovorax* sp. CHX100 revealed a novel cytochrome P450chx monooxygenase which catalyzes the transformation of cyclohexane to cyclohexanol. Primer walking method categorized CYP450chx as cytochrome P450 class I taking into account its operon structure: monooxygenase, FAD oxidoreductase, and ferredoxin....



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