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BIODEGRADATION OF PYRIDINE

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Pyridine and its derivatives occur in subsurface and groundwater as a result of various industrial activities. Pyridine is thought to be potentially carcinogenic and quite mobile due to high solubility in water. Aerobic and anaerobic bacteria capable of growth on pyridine as the sole source of carbon were isolated from contaminated environments and their characteristics and application were studied. An aerobic bacterium isolated from retort water was identified to be *Nocardioides* sp. OS4. Inoculation of this bacterium to contaminated retort water reduced significant fraction of organic carbon. Denitrifying strain *Azoarcus evansii* pF6 used the N-C2 ring cleavage pathway to degrade pyridine. However, pyridine metabolism by *Nocardioides* sp. OS4 may not use C2-C3 or N-C2 cleavage. Fatty acid composition of *Nocardioides* sp. OS4 was changed according to the growth substrates used. Suspended and Ca-alginate immobilized cells of *Nocardioides* sp. OS4 were used for degradation of pyridine. Immobilized cells degraded pyridine with volumetric pyridine degradation rates in the range of 0.082-0.129g/l/hr. The *Nocardioides* sp. OS4 preferred pyridine over other supplementary carbon sources. New denitrifying bacteria which could degrade pyridine in both aerobic and anaerobic conditions were isolated. The isolates were closely related to *Azoarcus evansii* by 16S rRNA sequence analysis. When pyridine concentration was above 1 g/l, specific growth rate in the denitrifying conditions was higher than that in aerobic conditions.

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EFFECT OF UPTAKE MODE ON HYDROCARBON BIODEGRADABILITY

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In this study, hydrocarbon uptake modes of seven oil-degraders were observed to determine whether there are differences in biodegradation rate of Arabian light crude oil by the mixed cultures. By the mixed cultures of oil-degraders having same modes of hydrocarbon uptake, such as strain US1 and K1(using pseudo-solubilized hydrocarbons by a biosurfactants), K2-2 and P1(using hydrocarbons by direct contact), CL180 and IC-10(mixed type of uptake modes), the biodegradation rates of aliphatics in the crude oil were increased more than those by their pure cultures, about 40%, 25% and 20%, respectively. Biodegradation rate of strain KH3-2(using only water-dissolved hydrocarbons) was increased by mixed cultures with strain K1, CL180 or IC-10 possessing high emulsifying activity. However, the biodegradation rate of the crude oil was decreased about 20%-40% by the mixed cultures of oil-degraders having different mode of hydrocarbon uptake, such as addition of strain US1 or K1 in the cultures of K2-2 or P1. Biosurfactants produced by US1 or K1 seems to enhance the emulsification of crude oil in aqueous phase but inhibit the attachment of K2-2 or P1 to crude oil. The mixed culture made of CL180, IC-10 and KH3-2 degraded 61.5% of aliphatics and 69% of aromatics in 3% (v/v) of Arabian light crude oil added.