Investigation on microbial degradation of car engine oil
－Analysis of degradation mechanisms of long chain hydrocarbons－

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Pollution by the petroleum hydrocarbon was known as continuing for a long term, and research on bioremediation of the pollution attracts the attention recently. Car engine oil was constituted from long chain hydrocarbons (mainly alicyclic hydrocarbons), and the spill of car engine oil was difficult to degrade in the nature. In addition, degradation mechanism of long chain hydrocarbons and alicyclic hydrocarbons were not clear. Therefore, in this study, we aim to isolate car engine oil degrading microorganisms from the nature and analyze the degradation mechanism of car engine oil of isolates.

Screening of car engine oil degrading microorganisms was tried by using car engine waste oil and fractions of car engine oil. Thirty six microorganisms were isolated from about 400 soil and water samples, and the isolates were identified by analyzing 16S rDNA and biochemical properties. Many isolates were classified as *Acinetobacter, Rhodococcus*, or *Gordonia*.

Degradation abilities of car engine oil and hydrocarbons of isolates, *Acinetobacter* sp. ODDK71, *Rhodococcus* sp. NDKK48, and *Gordonia* sp. NDKY76A, were analyzed in detail. *Acinetobacter* sp. ODDK71 was superior to degrade n-paraffin fraction of car engine oil. ODDK71 degraded *n*-alkanes (carbon length 12-30). C_{24} *n*-alkane was most preferred by ODDK71 result in identifying to average carbon length of n-paraffin fraction (23.4). ODDK71 did not use naphthene fraction and c-alkanes as a sole carbon and energy source. However, ODDK71 degraded alkylcyclohexane (alkyl side chain$\geqq$12) by co-oxidation with *n*-alkane. Analysis of degradation pathways by IR and GC/MS revealed that ODDK71 degraded dodecylcyclohexane via "alkyl side chain oxidation" and "ring oxidation". The ring oxidation pathway of dodecylcyclohexane was a novel pathway in microbial degradation of dodecylcyclohexane.

On the other hand, *Rhodococcus* sp. NDKK48 and *Gordonia* sp. NDKY76A used naphthene fraction and several cyclohexanes as a sole carbon source and energy. Analysis of degradation pathway of dodecylcyclohexane in NDKK48 resulted that the strain completely degraded dodecylcyclohexane via aromatization of cyclohexanecarboxylic acid.