

Microbial Screening from Activated Sludge in Degradation of Dimethyl - Sulfoxide in Airlift Bioreactor

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Abstract

DMSO (dimethyl sulfoxide) is a useful and inexpensive environment benign solvent easy to recycle. Its industry-wide adoption has revealed an odorous problem to the industrial parks and their adjacent residential areas due to its decomposition product, DMS (dimethyl sulfide). Our previous research goal is to develop a feasible biological treatment technology to effectively treat the DMSO into oxidative pathway instead of going to the DMS pathway. We have adopted the specific activated sludge as bacterial inoculums to decompose the DMSO into DMSO₂ pathway from the wastewater treatment plant of a DMSO-producing chemical plant. In the performance of airlift bioreactor, the free cell system can degrade the 850-mg L⁻¹ DMSO within 10 hr and has high stability of repeated batch. In this study, we focus on the microbial screening of biological sludge capable of degrading dimethyl sulfoxide (DMSO) in airlift bioreactor were analyzed by using a polymerase chain reaction (PCR)-cloning method. Three different suspension conditions from static and dynamic for biological sludge were examined. The bacteria of the different sludge type were found to be *Serratia liquefaciens*, *Brevibacillus brevis*, *Ochrobacterum* sp., *Bacillus subtilis*, *Pseudomonas* sp. and *Pseudomonas fluorescens* which were previously found as denitrifying bacteria, polyphosphate-accumulating bacteria and phenol-utilizing bacteria. From the supernatant of the static sludge or the dynamic sludge, nine strains which could utilize 0.05% (w/w) DMSO with 0.05% (w/w) methanol were isolated and identified. In addition, the newly isolated *Pseudomonas* sp. might be the most predominant DMSO-degrading microorganism existing in our airlift bioreactor.

Keyword : DMSO (dimethyl sulfoxide); airlift bioreactor; identification; DMSO-utilizing bacteria; PCR-Cloning