

## **Immobilization of *Exiguobacterium* sp. AO-11 for bioremediation of crude oil-contaminated seawater**

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Marine oil spills are serious problems affecting both ecosystems and human health. Bioremediation has been proposed as an alternate method for the clean-up of oil-contaminated area. This study aims to develop ready-to-use bacteria for bioremediation of marine oil spills. Cell immobilization has been reported as an efficient approach to improve the biodegradation process of toxic compounds. In this study, different types of carrier material including polyurethane foam, aquaporous gel, and bio-cord were screened for the immobilization of bacteria. Based on adsorption activity, biomass capacity, and cost, bio-cord was selected for immobilizing of *Exiguobacterium* sp. AO-11 which previously identified as crude oil-degrading bacterium. The results demonstrated that the immobilized AO-11 removed 93.0% of 2,000 mgL<sup>-1</sup> of crude oil within 9 days while free cell removed around 65.5%. Moreover, the reusability of immobilized AO-11 cells was examined. The results showed that the immobilized AO-11 cells could be reused at least 5 cycles (35 days). The stability of AO-11 cells on bio-cord was confirmed by Scanning electron microscope. Additionally, the effect of oil dispersant addition on the bacterial growth and crude oil removal was investigated. The Slickgone NS did not inhibit the growth of AO-11 cells. For free cells, the addition of Slickgone NS increased crude oil removal from 65.5 to 85.7%. While, crude oil removal efficacy of the immobilized cells was maintain at high level (90%) in the presence of Slickgone NS. The results showed the potential use of the immobilized AO-11 cells on bio-cord for future applications in remediating crude oil-contaminated seawater.

**Keywords:** crude oil, oil spill, bioremediation, oil dispersant, Slickgone NS

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