

Synthetic Microbial Community for the Bioremediation of Petroleum Contamination

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Editorial

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Editorial

Environmental contamination is always a research topic in petroleum industry, because it is hard to totally avoid oil spill in the field ground and during the transportation. Sometimes, the contamination scale can be huge and significant in the worst case, like the massive Deepwater Horizon Oil Spill in 2010 [1]. This oil spill

[Figure 1] resulted in 4.1 million barrels of oil input into the Gulf of Mexico and serious contamination of waters, estuaries, beaches and wetlands, which led to an ecological disaster to the indigenous species [2-6]. BP, the company responsible for this, agreed to pay \$18.7 billion in fines in July, 2015.



Figure 1: NASA's Terra Satellite image observation on the Deepwater Horizon Oil Spill next to Mississippi Delta on 24 May 2010. The Sun's reflection changes revealed how large the scale of the oil contamination was in the Open Ocean and coastal areas.

Compared with physical and chemical remediation, bioremediation has its own advantages, such as, cost-effective, environmental friendly and applicable over

large areas [7,8]. A key element in bioremediation is the active species that plays a role in the biodegradation of hydrocarbons. Sarkar applied next generation sequencing

approach to analyse the composition of indigenous microbial community for bioremediation of petroleum refinery sludge [9]. Based on the contamination levels and types, the microbial community structure would shift or response accordingly [10,11]. Because the fractions of light crude oil and heavy oil vary a lot, a microbial community that are specific to degrade certain oil fraction or general hydrocarbons will be more cost-effective in dealing with the oil contamination based on the contamination types.

Synthetic microbial community can be considered as a model system for understanding the natural communities by focussing on its determined function and key metabolic interactions [12]. When several microbes (specific for degrading the main hydrocarbons in the contaminated field) are combined in the application, the competition for other nutrients with non-active microorganisms can be avoided, therefore the efficiency of bioremediation can be increased. However, the selection and application should be based on the understanding of the synthetic communities. As shown in Figure 2, it is necessary to understand the capacity of each species and the interactions between two/ among the three microorganisms to stimulate the degradation ability of the constructed community and to minimize any potential competition. Chen isolated seven crude oil degrading bacteria and constructed a synthetic microbial community specific for degrading viscous oil using three microorganisms out of seven. A mixed microbial consortia was applied to degrade phenol using 22 phenol degraders [13,14]. Tao used an indigenous bacterial co-culture with exogenous *Bacillus subtilis* to enhance the biodegradation of crude oil [15].

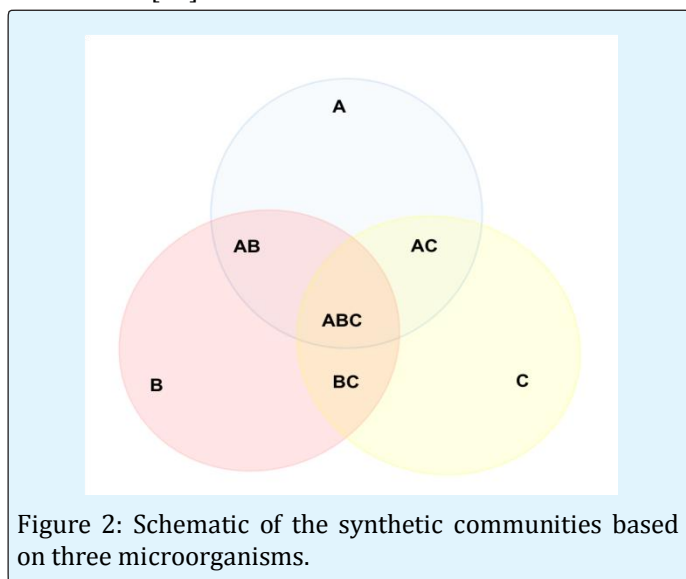


Figure 2: Schematic of the synthetic communities based on three microorganisms.

This editorial highlights the necessity of research on petroleum bioremediation and the importance of the strategy of synthetic microbial community to enhance bioremediation.

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