



Insights into microbial communities in suboxic and anoxic parts of the Dagang oilfield

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The overall target of this research is to understand the ecology of facultative and anaerobic bacterial communities related to hydrocarbon degradation in a part of the Dagang oilfield. In the oilfield since many years large amounts of water and surfactants are injected for oil extraction. This mode of oil production will likely affect the microbial community structure in the semi-open recycling system. In the production water, aerobic and facultative anaerobic bacteria are abundant, but their ecological function in the reservoir is still not understood. For microbial enhanced oil recovery (MEOR) however, it is important to understand the role of these microbial communities in the reservoir.

For characterising the microbial community, the abundances of bacteria, archaea, sulfate reducing bacteria (SRB) and methanogenic Archaea were measured by real-time quantitative PCR in both injection and oil water, meanwhile the functional gene P450 involved aerobic degradation was also determined using common PCR with specific primers. In this study, it found that injection well1095 has a higher abundance of bacteria, archaea, dsr A and mcr A than those in most of production water, suggesting that a majority of bacteria not growth in the reservoir. Furthermore, on the basis of functional gene measurement aerobic and anaerobic microorganisms were living together in the extreme oil reservoirs.

In contrast, the percentage of dsr A to bacteria and mcr A to archaea in production well exceeds the number in most of production wells. These results indicate that some indigenous bacteria such as SRB and methanogen can adjust them to reservoir environments. Methanogenic Archaea are widespread in the anaerobic environment and play an important role in the terminal steps of organic matter degradation to form methane, while SRB are capable of mineralizing petroleum components. The analysis of the production water reveals that concentration of SO_4^{2-} and NO_3^- in injection water is lower than them in production wells. The low concentration of electron acceptors such as SO_4^{2-} and NO_3^- in oil reservoirs make it unlikely the SRB are very active in these oil reservoirs. Biogenic methane was found in this reservoir and the high abundance of methanogens probably reflects microbial methanogenesis related to oil degradation.