Effect of BTEX and Ethanol on Biodegradation of MTBE

Ruiling Zhang[1,2] Xingang Li[1,2] Zhilong Ou[1,2] Guoqiang Huang[1,2]
(1.National Engineering Research Center for Distillation Technology, Tianjin 300072, China.
2.School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China)

Methyl-tert-butyl (MTBE) is widely used in gasoline to reduce ozone and carbon monoxide emissions. However, it is highly water-soluble and does not absorb well to sediments, making it move quickly through groundwater systems. In addition, MTBE resists biological degradation, compared to other gasoline components, probably because of the high energy required to cleave its ether bond. The contamination of groundwater and consequent drinking water with MTBE has become an increasing problem due to its potential hazardous to human health.

Bioremediation is a cost-effective cleanup technology that could offer great promise in removing MTBE from groundwater. The effect of alternative substrates on MTBE degradation is an important issue for bioremediation. It is usually the case that MTBE is not the sole carbon substrate in contaminated groundwater. Such as benzene, toluene, ethyl-benzene, and xylenes (BTEX), these compounds are the most water-soluble constituents of reformulated gasoline, and they often accompany MTBE contamination. Evaluating the impact of contaminant mixtures on the degradation of MTBE is useful for predicting the behavior of these compounds in biological treatment systems and could contribute to improved approaches for implementing engineered bioremediation.

In this study, the effects of BTEX and ethanol on the degradation of MTBE were investigated so as to predict the behavior of these compounds and to determine whether the presence of an alternative substrate, which is generally the case in the field, has an effect on MTBE degradation.

Contrary to the conception of BTEX directly interferes with MTBE degradation by PM1 (Deeb et al, 2001) and BTEX did not have a noticeable effect on MTBE degradation by a mixed bacterial culture (Sedran1 et al, 2002), BTEX can significantly enhance the MTBE degradation for the new strain *Chryseobacterium sp*.A-3 isolated with MTBE as the sole carbon and energy source from MTBE plant soil from China. This discrepancy is most likely due to the diversity of the culture used in this study.

In addition, ethanol is likely to replace MTBE as an oxygenate in gasoline, although ethanol is unlikely to be a groundwater pollutant, it is significant to study the effect of ethanol on biodegradation of MTBE. The result showed that the presence of ethanol can also enhance the ability of MTBE degradation in the batch studies.

These results will be a great advantage for the success of treatment systems near the source of the plume where MTBE, BTEX and ethanol coexist.

Key words: MTBE; BTEX; Ethanol; Biodegradation

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