

STABLE ISOTOPE ANALYSIS IN REMEDIATION OF GASOLINE OXYGENATES AND HYDROCARBONS

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The presentation will address applications of compound-specific stable isotope analysis (CSIA) to monitoring of natural attenuation of MTBE and other gasoline VOC, in particular, the recent results from IPEC-funded research. The presentation will discuss results from microcosm experiments on oxygenate biodegradation, stable isotope analysis of commercial gasolines and experiments on verification of isotope effects in abiotic attenuation processes. Completed and on-going methanogenic and sulfate reducing microcosm studies provided better definition of isotope fractionation magnitude upon MTBE biodegradation. The values of carbon isotope enrichment factor were obtained from cultures grown in agitated soil to assure uniform medium distribution and accurate calculation of enrichment factor. The results for various cultures are similar to each other and higher than the previously reported values (values cluster around -18). It is proposed that calculation of anaerobic biodegradation progress based on Rayleigh model should use this value of enrichment factor. No microcosm evidence of TBA biodegradation has been obtained yet at the time of the abstract submission. Results of a study of carbon and hydrogen isotope composition of individual compounds (MTBE, TBA, and aromatics) of various commercial gasolines will be presented. The obtained collections of carbon and hydrogen isotope ratios provide a benchmark for identifying isotope fractionation in environmental samples; in addition, they demonstrate the forensic potential of the CSIA approach. In particular, no reference data on TBA isotope composition were available to date.