

Volatile Organic Compound Fate in Phytoremediation Applications: Natural and Engineered Systems

Joel G. Burken*, Xingmao Ma, Garrett C. Struckhoff, and Amanda W. Gilbertson

Environmental Research Center, Department of Civil, Architectural & Environmental Engineering, University of Missouri Rolla, Rolla Missouri, USA. E-mail: burken@umr.edu

* Author for correspondence and reprint requests

Z. Naturforsch. **60c**, 208–215 (2005)

Unique sampling techniques have generated a new understanding regarding the fate of volatile organic compounds (VOCs) in phytoremediation systems. Tissue sampling and diffusion traps were used to determine how VOCs are transported in and diffuse from vegetation, particularly woody species. These techniques were then utilized to observe how plants interact with different contaminated media, showing transport of contaminants occurs from the vadose zone (vapor phase) as well as the saturated zone (aqueous phase). Data was gathered in laboratory studies, in native vegetation, and in engineered phytoremediation systems. The findings reveal that diffusion from the xylem tissues to the atmosphere is a major fate for VOCs in phytoremediation applications. Linking VOCs' fate with groundwater hydraulics, mass removal rates from contaminant plumes can be estimated. These techniques were also utilized to observe the impact of engineered plant/microbe systems, which utilize recombinant, root-colonizing organisms to selectively degrade compounds and subsequently alter the fate of VOCs and other organic compounds. The genetically enhanced rhizoremediation methods pose a novel approach that may allow for biodegradation of compounds that formerly were considered recalcitrant.

Key words: Phytoremediation, Volatile Organic Compound, Poplar, Rhizosphere