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Kuder Enviro-Isotopes

Dr. Tomasz Kuder

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Education

Ph.D., Organic Geochemistry, Southern Illinois University Carbondale, USA, 2000.

Employment

Kuder Enviro-Isotopes LLC (2024-present). Role: CEO, Lead Scientist, Stable Isotope Chemist. Operation of service laboratory and consulting. Development of commercial CSIA service products and applied research.

Univ. of Oklahoma, Norman, Oklahoma (2000-2024). Role: Research Scientist, Stable Isotope Chemist. Technical (2002-2024) and administrative (2015-2024) supervision of the Compound-specific Stable Isotope Analysis (CSIA) laboratory at the Univ. of Oklahoma, including supervision of personnel, method development, grant proposal writing, project management, project reporting, and preparation of peer-reviewed publications.

Research Interests

Analytical chemistry of light isotope analysis with a focus on CSIA applications. Chemistry of environmental contaminants. Uses of CSIA in contaminated site assessment and broadly in environmental forensics.

Projects (service/commercial), selected

Supervision of analysis (CSIA) and reporting for 1000+ individual site assessment projects, for sites contaminated with MtBE, benzene, chlorinated ethenes, ethylene dibromide, 1,4-dioxane, oil and gas exploration sites, etc.

Technical expert for CSIA-related litigation.

Project (R&D), selected

Development of Protocols to Quantify Abiotic Transformation Rates and Mechanisms for Chlorinated Ethenes in Water Supply Aquifers (ER-201368). Co-PI. US DoD/SERDP-funded project to investigate the role of magnetic materials in mediating abiotic degradation of chlorinated ethenes in aquifers (in progress).



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- Identification of Abiotic Degradation Pathways of Chlorinated Ethenes by Compound-Specific Stable Isotope Analysis (ER-2623). Lead PI. US DoD/SERDP-funded project to investigate isotope effects in alternative pathways of degradation of chlorinated ethenes (completed in 2020).
- Investigation of the environmental fate of brominated organic contaminants by advancing three-dimensional $\delta^{13}\text{C}$ - $\delta^2\text{H}$ - $\delta^{81}\text{Br}$ compound-specific isotope analysis. Co-PI. NSF/BSF-funded project to investigate isotope effects in transformations of brominated compounds (completed in 2019).
- Monitored Natural Attenuation and Biostimulation for In Situ Treatment of 1,2-Dibromoethane (ER-201331). Co-PI. US DoD/ESTCP-funded project to evaluate rates of EDB natural attenuation and biostimulation in groundwater, including the use of compound-specific stable isotope analysis to estimate EDB degradation rates (completed in 2018).
- Integrated stable isotope – reactive transport model approach for assessment of chlorinated solvent degradation (ER-201029). Co-PI. US DoD/ESTCP-funded project to develop an integrated compound-specific stable isotope analysis-reactive transport model approach for the assessment of chlorinated solvent sites (completed in 2016).
- Use of Compound-Specific Stable Isotope Analysis to Distinguish between Vapor Intrusion and Indoor Sources of VOCs (ER-201025). Technical lead for CSIA. US DoD/ESTCP-funded project to demonstrate the use of sorbent samplers and CSIA to distinguish between vapor intrusion and indoor VOC sources (completed in 2014).

R&D Highlights

- Development of innovative CSIA methods for environmental VOCs. The laboratory of the Univ. Oklahoma was the first in the USA to develop robust methods for CSIA for low-concentration groundwater contaminants (e.g., Kolhatkar et al., 2002).
- Applications of CSIA in the studies of contaminant attenuation – including first demonstrations of anaerobic degradation of MtBE occurring at contaminated field sites (Kolhatkar et al., 2002; Kuder et al., 2005; these studies became a major factor in acceptance of the cost-effective natural attenuation remedy for MtBE sites and for the acceptance of CSIA as a routine field assessment tool).
- Early demonstration of 2D CSIA (dual-element CSIA) to discriminate between degradation mechanisms (Kuder et al., 2002, Kuder et al., 2005). Today, 2D CSIA is one of the most useful tools for characterization of contaminant degradation processes.
- Development of novel CSIA methods for analysis of VOCs in air for the assessment of vapor intrusion sites (McHugh et al., 2011, Klisch et al., 2012).
- Development and demonstration of a novel method for H CSIA of halogenated ethenes (Kuder and Philp, 2012; Kuder et al., 2013).
- Development and demonstration of novel two-dimensional chromatographic methods for CSIA of environmental contaminants in complex organic matrices (McHugh et al., 2013 and Reports from ER-201025 and ER-201331).



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Professional Service

Reviewer of manuscripts for publication in the top ranked journals in environmental sciences:

Environmental Science and Technology, Environmental Science and Technology Letters, Analytical Chemistry, Organic Geochemistry, Journal of Contaminant Hydrology, Rapid Communications in Mass Spectrometry, Environmental Pollution, Chemosphere, Atmospheric Environment, Geochimica Cosmochimica Acta, Nature Water, etc.

Conference Session Chair: Invited session chair at Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds (Chlorcon) in 2014 (Monterey, CA) and 2018 (Palm Springs, CA); Invited session chair at Isotopes (an international cross-disciplinary conference on stable isotope sciences) in 2015 (Jerusalem, Israel). Session chair at 2014 Geochemical Society Goldschmidt Conference (Sacramento, CA).

Selected Publications

H-index 19 (Google Scholar 2025-02-21)

- Kuder, T., and Ojeda, A.S. (2023) Hydrogen Isotope Exchange between Trichloroethene and Water under Mild Environmental Conditions—Implications for the Use of Hydrogen CSIA in Contaminated Site Assessment. *ACS ES&T Water*. 3, 712-719.
- Thouement, H.A.A., Kuder, T., Heimovaara, T., and van Breukelen, B.M. (2019) Do CSIA data from aquifers inform on natural degradation of chlorinated ethenes in aquitards? *Journal of Contaminant Hydrology*; 226, 103520.
- Golan, R., Gelman, F., Kuder, T., Taylor, A.A., Ronen, Z., and Bernstein A. (2019) Degradation of 4-bromophenol by *Ochrobactrum* sp. H11 isolated from desert soil: pathway and isotope effects. *Biodegradation*, 30, 37-46.
- Kuder, T., Bernstein, A., and Gelman, F. (2019) Derivatization-Free Method for Compound-Specific Isotope Analysis of Nonexchangeable Hydrogen of 4-Bromophenol. *Rapid Communications in Mass Spectrometry*. 33, 667-677.
- Koster van Groos, P.G., Hatzinger, P.B., Streger, S.H., Vainberg, S., Philp, R.P., and Kuder, T. (2018) Carbon isotope fractionation of 1,2-Dibromoethane by biological and abiotic processes. *Environmental Science & Technology*, 52, 3440-3448.
- Segal, D.C., Kuder, T., and Kolhatkar, R. (2018) Assessment of anaerobic biodegradation of bis (2-chloroethyl) ether in groundwater using carbon and chlorine compound-specific isotope analysis. *Science of the Total Environment*, 625, 696-705.
- Van Breukelen, B.M., Thouement, H.A.A., Stack, P.E., Vanderford, J. M., Philp, P., and Kuder, T. (2017) Modeling 3D-CSIA data: Carbon, chlorine, and hydrogen isotope fractionation during reductive dechlorination of TCE to ethene. *Journal of Contaminant Hydrology*, 204, 79-89.
- Lu, J., Muramoto, F., Philp, P., and Kuder, T. (2016) Monitoring in situ biodegradation of MTBE using multiple rounds of compound-specific stable carbon isotope analysis. *Ground Water Monitoring and Remediation*, 36, 62-70.



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- Kuder, T., van Breukelen, B.M., Vanderford, M., and Philp, P. (2013) 3D-CSIA: carbon, chlorine, and hydrogen isotope fractionation in transformation of TCE to ethene by a Dehalococcoides culture. *Environmental Science & Technology*, 47, 9668–9677.
- Kuder, T., and Philp, P. (2013) Demonstration of compound-specific isotope analysis of hydrogen isotope ratios in chlorinated ethenes. *Environmental Science & Technology*, 47, 1461–1467.
- Klisch, M., Kuder, T., Philp, R.P., and McHugh, T.E. (2012) Validation of adsorbents for sample preconcentration in compound-specific isotope analysis of common vapor intrusion pollutants. *J. Chromatography A*, 1270, 20-27.
- McHugh, T., Kuder, T., Fiorenza, S., Gorder, K., Dettenmaier, E., Philp, P. (2011) Application of CSIA to distinguish between vapor intrusion and indoor sources of VOCs. *Environmental Science & Technology*, 45, 5952-5958.
- Kuder, T., Wilson, J.T., Kaiser, P., Kolhatkar, R., Philp, P., and Allen, J. (2005) enrichment of stable carbon and hydrogen isotopes during anaerobic biodegradation of MTBE: microcosm and field evidence. *Environmental Science and Technology*, 39, 213-220.
- Kuder, T., Wilson, J.T., Philp, P., and He, Y.T. (2012) Carbon isotope fractionation in reactions of 1,2-dibromoethane with FeS and hydrogen sulfide. *Env. Science & Technology*, 46, 7495–7502.
- Kuder, T., Philp, P., and Allen, J. (2009). Effects of volatilization on carbon and hydrogen isotope ratios of MTBE. *Environmental Science and Technology*, 43, 1763–1768.
- Buscheck, T., Kuder, T., Philp, P., Kolhatkar, R and Klinchuch, L. (2009) Two-dimensional compound specific isotope analysis to assess remediation system effectiveness. In: *Proceedings of the Tenth International Battelle in Situ and On-Site Bioremediation*. Baltimore, Maryland.
- Philp, R.P. and Kuder, T. (2008). Biomarkers and stable isotopes in environmental forensic studies. In: (S.M. Mudge-Editor) *Methods in Environmental Forensics*. Ch. 4. Pp. 113-171. CRC Press, Boca Raton, Florida. 315-334.
- Kuder, T., and Philp, P. (2008) Modern geochemical and molecular tools for monitoring in-situ biodegradation of MTBE and TBA. *Reviews in Env. Science and Bio/Technology*, 7, 79–91.
- Henderson, J.K., Freedman, D.L., Falta, R.W., Kuder, T., and Wilson, J.T. (2008) Anaerobic biodegradation of ethylene dibromide and 1,2-dichloroethane in the presence of fuel hydrocarbons. *Environmental Science and Technology*, 42, 864–870.
- Liang, X., Dong, Y., Kuder, T., Krumholz, L.R, Philp, R.P., and Butler, E.C. (2007) Distinguishing abiotic and biotic transformation of tetrachloroethylene and trichloroethylene by stable carbon isotope fractionation. *Environmental Science and Technology*, 41, 7094-7100.
- Kuder, T., Wilson, J.T., Kaiser, P., Kolhatkar, R., Philp, P., and Allen, J. (2005) enrichment of stable carbon and hydrogen isotopes during anaerobic biodegradation of MTBE: microcosm and field evidence. *Environmental Science and Technology*, 39, 213-220.
- Kuder, T., Philp, R.P., Kolhatkar, R., Wilson, J.T., and Allen, J. (2002) Application of stable carbon and hydrogen isotopic techniques for monitoring biodegradation of MTBE in the field. NGWA Meeting, Atlanta, 2002. In: *Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in Groundwater*, National Groundwater Association: Atlanta, GA, pp. 371-381.
- Kolhatkar, R., Kuder, T., Philp, P., Allen, J., and Wilson, J.T. (2002) Use of compound-specific stable carbon isotope analyses to demonstrate anaerobic biodegradation of MTBE in groundwater at a gasoline release site. *Environmental Science and Technology*, 36, 5139-51.