Professor René Schwarzenbach

2005 AEESP Distinguished Lecturer

Hosted by

The Department of Environmental Sciences, Rutgers University
The Department of Civil and Environmental Engineering, Princeton University

Presents

Use of Stable Isotope Fractionation to Assess Organic Pollutant Transformation in Contaminant Hydrology

Monday, September 19, 2005, 1:30 pm
Philip Alampi Room
Institute of Marine and Coastal Sciences (IMCS), Cook College
Rutgers University, New Brunswick NJ
Refreshments at 1:00 pm in the IMCS Lobby

Abstract

In recent years, Compound Specific Isotope Analysis (CSIA) has undergone a rapid development towards important new applications in contaminant hydrology and organic biogeochemistry. With CSIA, the relative abundance of the heavy and light isotopes of a given element (e.g. $^{2}H/^{1}H$, $^{13}C/^{12}C$, $^{15}N/^{14}N$, $^{18}O/^{16}O$, $^{37}Cl/^{35}Cl$) can be determined for a given compound. Such bulk isotope ratios (= ratios averaged over the bulk compound), particularly, when available for more than just one element (e.g., H and C, C and N) may be extremely useful for (i) identification of contaminant sources, (ii) qualitative assessment of transformation processes, (iii) assessment of reaction pathways and reaction mechanisms, and (iv) quantification of transformation processes, particularly in complex systems. For the assessment of reaction pathways and for quantification of transformation processes, enrichment factors have to be derived from series of isotope measurements at different times and/or locations. For the interpretation of such enrichment factors, it is necessary to convert them properly to apparent kinetic isotope effects. In the lecture, the possibilities and limitations of the application of isotope fractionation data to assess organic pollutant behavior in natural and engineered systems will be discussed using a variety of practical examples including chlorinated solvents, gasoline components (BTEX), MTBE, and nitroaromatic explosives.

The Association of Environmental Engineering and Science Professors (AEESP) Distinguished Lecturer for 2005 is Dr. René Schwarzenbach, full Professor of Environmental Chemistry at the Federal Institute of Technology (ETHZ) in Zurich, Switzerland. Currently he is the head of the Department of Environmental Sciences (UWIS) at ETHZ and of the Institute for Aquatic Sciences and Water Pollution Control (IGW) located at the Federal Institute for Environmental Science and Technology (EAWAG). He is also a scientific counselor of the Swiss National Science Foundation, and he serves as a member of the Advisory Board of Environmental Science and Technology. His textbook "Environmental Organic Chemistry" that he authored together with colleagues from MIT and ETHZ, and that won the "Chemistry Book of the Year Award" of the Association of American Publishers in 1994, has established itself as the standard text in the field of environmental organic chemistry. The second, completely revised and expanded edition has appeared in 2003.

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