

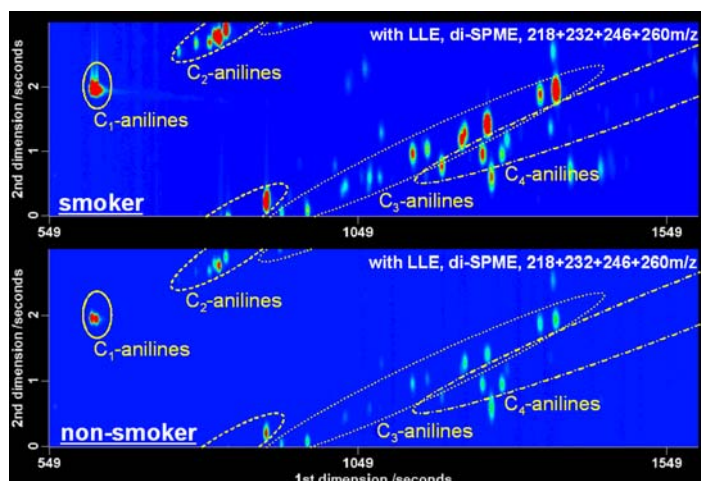


Department of Instrumental Analytical Chemistry

Research Interests of the Chair of Instrumental Analysis are based on two fields: Analytical Chemistry and Environmental Chemistry

Analytical Chemistry

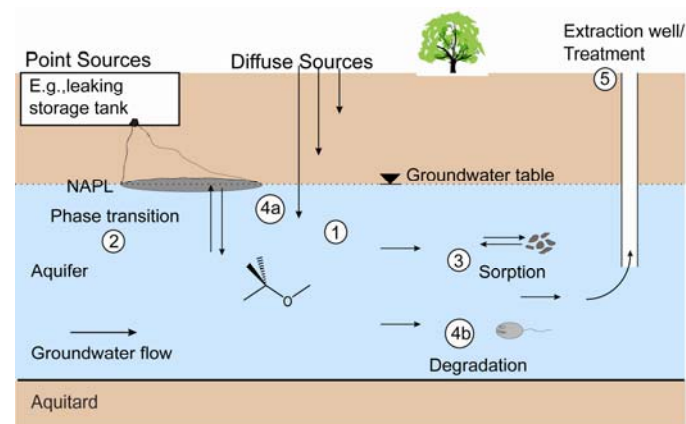
The work in our group mostly involves separation techniques. In gas chromatography we are focusing on the use of a variety of solventless extraction/enrichment techniques such as solid phase microextraction (SPME) and in-needle trap techniques. These allow the sensitive and automated analysis of volatile and semivolatile organic compounds in aqueous matrices, with emphasis on polar non-ionic compounds that are well soluble in water. In HPLC we develop and utilize online extraction systems and subcritical water chromatography. In both areas we are interested in an increase of separation efficiency by multidimensional chromatography. Furthermore, we tackle both very fundamental questions, e.g. of phase partitioning, and applications to real-world problems. A special area of interest is the hyphenation of compound-specific isotope analysis (CSIA) with GC and HPLC separations. Method developments in this area focus on improving sensitivity in isotope analysis.



Analysis of urine samples for aromatic amines with GCxGC

Environmental Chemistry

Focus of the research activities in this area are sources, behavior and fate of organic contaminants in the environmental compartments soil and water. The following scheme illustrates the various aspects of our work with the example of the fuel oxygenate methyl *tert*-butyl ether (MTBE) that has been intensively studied in our group. Other compound classes currently of special interest include short-chain chlorinated paraffins, perfluorinated compounds, heterocyclic compounds, and amines.



- (1) *Identification and quantification* of organic trace compounds in environmental matrices
 - (2) *Equilibrium partitioning* between liquid organic mixtures (i.e., NAPLs) and water, *kinetics of mass transfer* and *effects of organic phase aging* on these processes
 - (3) Relevant *sorption processes* under various environmental conditions and soil parameters and means to better predict sorption based on thermodynamic considerations
 - (4a) *Source apportionment* and *differentiation of immission pathways* (e.g., diffuse vs. point sources)
 - (4b) Abiotic and biotic *transformation*, e.g., dehydrochlorination vs. reductive dechlorination of highly chlorinated ethanes.
- Both topics in 4 are studied mainly by applying compound-specific stable isotope analysis (CSIA) for carbon, hydrogen, nitrogen and oxygen.
- (5) Fundamental and applied studies of *water treatment* methods, including sorptive technologies and advanced oxidation Processes (AOPs).