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Compound Specific Stable Sulfur Isotope Analysis (δ34S and δ33S) of Organic Compounds Using Gas Chromatography Hyphenated with Multiple Collector Inductively Coupled Plasma Mass Spectrometry (GC-MC-ICPMS)

Kümmel Steffen[1], Gelman Faina[2], Horst Axel[1], Strauß Harald[3], and Gehre Matthias[1]
[1]Department of Isotope Biogeochemistry, Helmholtz Centre for Environmental Research GmbH, Leipzig, Germany
[2]Geological Survey of Israel, Jerusalem, Israel
[3]Institut für Geologie und Paläontologie, Westfälische Wilhelms-Universität Münster, Münster, Germany

Stable sulfur isotope analysis is potentially applicable in various fields in forensics and environmental analytics to investigate the sources and degradation of organic compounds, many of them being priority pollutants in groundwater and the atmosphere. A broader use of sulfur isotopes of organic compounds in environmental studies is still hampered by the availability of precise and easy-to-use techniques. Here we present a method for the determination of stable sulfur isotope ratios using gas chromatography coupled with multiple-collector inductively coupled plasma mass spectrometry (GC-MC-ICPMS) which can be used for both $\delta^{34}S$ and $\delta^{33}S$ analysis. The method was evaluated using the reference materials IAEA-S-1, IAEA-S-2 and IAEA-S-3 which were converted offline to SF_6 prior to analysis. Standardization was carried out by using a two-point calibration approach. The $\delta^{34}S$ values obtained by our method are in good agreement (within analytical uncertainty) with the results obtained by the conventional dual inlet method. Additionally, the impact of the used mass resolution (low and medium), the influence of auto-protonation of sulfur isotopes and the effect of isobaric interferences of O_2^+ on the obtained isotopic ratios was investigated. The analytical precision (1σ) for $\delta^{34}S$ and $\delta^{33}S$ values was usually better than ±0.1 ‰ for analytes containing >0.1 nmol S. Thus, the presented compound-specific online method should be sufficiently precise to address a wide variety of research questions involving mass independent isotope effects of sulfur-containing organic compounds to discriminate sources or biological and chemical reactions in the environment.