Unravelling the fate of organic micropollutants in aquatic systems using multi-element stable isotope analysis

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The frequent detection of organic micropollutants such as pesticides, consumer care products or pharmaceutical in water is an increasing concern for human and ecosystem health. Currently, little is known about the long-term fate of such compounds in aquatic systems due to the difficulty in demonstrating their degradation. Compound-specific isotope analysis (CSIA) of multiple elements is a promising method to evaluate organic micropollutant transformation because pathway-specific isotope fractionation is expected to occur for many compounds. For classical priority pollutants such as chlorinated and petroleum hydrocarbons, CSIA has become a well-established method to identify and quantify degradation pathways. CSIA of polar organic micropollutants is demanding because they tend to occur at low concentrations, are challenging to extract from water, more difficult to transform to the IRMS measurement gas and are transformed by numerous mechanisms, whose isotope effects are not known yet.

The presentation provides an overview of recent advances for the extension of CSIA to organic micropollutants. New analytical approaches will be discussed to make multi-element CSIA analysis feasible at environmental concentrations despite complex matrices. The potential of multi-element CSIA to gain new insight into the micropollutants dynamics will be highlighted with field studies.