P312-WE

SOURCING VOCS IN INDUSTRIAL EMISSIONS BY COMPOUND SPECIFIC ISOTOPE ANALYSIS

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This present research is based upon the development of a method for measuring $\delta^{13}C$ of low-molecular-weight VOCs in airborne samples by TD-GC-ir-MS (Thermal Desorption – Gas Chromatography – Isotopic Ratio – Mass Spectrometry)[Turner et al. 2006]. In the latter study it was proven that thermal desorption causes no/negligible carbon isotopic fractionation of selected VOCs (benzene, toluene, chlorobenzene, ethylbenzene, *m*-xylene and propylbenzene).

Measurements of hydrogen isotopes of VOCs in air have never been studied in sufficient detail, particularly by thermal desorption compound specific isotope analysis. Because hydrogen has the biggest mass difference (2:1) between its two stable isotopes and thus, the largest natural deviation in stable isotope ratios; this makes the measurement of δD of VOCs a more attractive technique than $\delta^{13}C$ alone for assessing their source(s). This project will strengthen the work of Turner et al. (2006) and the method will be expanded to include δD measurements of VOCs in air samples. A variety of multilayered absorbent resins are being tested to target a large range of VOCs [Kuntasal et al. 2005] than those previously investigated [Turner et al. 2006] and will be used as a comparison. Other important factors that are likely to influence δD of VOCs (e.g. air humidity, combustion temperature and photochemical oxidation) will be also under investigation during the course of this work.

The method developed will then be used to establish the sources of VOCs in real airborne emissions, for example, from a local industry stack with different processing temperatures and combustion materials and car exhaust emissions with different motor and fuel types as well as VOCs emitted from a bush fire simulation experiment.

Measuring the δD of VOCs in airborne samples remains a significant analytical challenge particularly because of their low concentrations. Therefore a routine compound specific isotope method with thermal desorption for determining the δD of individual VOCs in ambient air is under development as well.

REFERENCES

Kuntasal, O.O., Karman, D., Wang, D., Tuncel, S.G., Tuncel, G., 2005. Determination of volatile organic compounds in different microenvironments by multibed adsorption and short-path thermal desorption followed by gas chromatographic-mass spectrometric analysis. Journal of Chromatography A 1099, pp.43-54

Turner, N., Jones, M., Grice, K., Dawson, D., Ioppolo-Armanios, M., Fisher, S.J., 2006. $\delta^{13}C$ of volatile organic compounds (VOCS) in airborne samples by thermal desorption-gas chromatography-isotope ratio-mass spectrometry (TD-GC-IR-MS). Atmospheric Environment 40, 3381-3388