Human health risk assessment of a closed landfill based on direct gas measurements

I. JUBANY[1], E.GALLEGO[2], J. GIMÉNEZ[3*], V.MARTÍ[13], J.F.PERALES[2], F.J.ROCA AND J DE PABLO[13]

[1]Fundació CTM Centre Tecnològic, Av. Bases de Manresa,1, 08242 Manresa, Spain (irene.jubany@ctm.com.es)
[2]Laboratori del Centre de Medi Ambient, UPC, Avda. Diagonal, 647, 08028 Barcelona, Spain (eva.gallego@upc.edu, jose.francisco.perales@upc.edu, fco.javier.roca@upc.edu)
[3]Chemical Engineering Department, UPC, Avda. Diagonal, 647, 08028 Barcelona, Spain (vicens.marti@upc.edu, francisco.javier.gimenez@upc.edu, joan.de.pablo@upc.edu,)

A human health risk assessment (HHRA) for a former landfill located at Cerdanyola del Vallès (Catalonia, Spain) was performed to evaluate the present risk of the identified receptors in the area and to the receptors of a the future urban planning. A former clay extraction activity in the area caused the existence of three 40m-deep holes which were aftewards filled with several types of industrial waste during the 80's. After landfill closing in 1995 several sudies have been performed to assess the effect of the landfilled wastes to the environment. The innovative aspect of HHRA in this study was based on direct measurements of volatile organic compounds (VOC) in the urban air (immission concentrations around landfill), fluxes from the subsoil and surface emission.

Therefore, 130 VOC were identified and 70 quantified (odor, toxic and irritant compounds) in outdoor air at 4 urban sites located close to the landfill. The emission flux of the same compounds was determined in 5 points on the surface of the landfill, and soil gas composition at 5m-deep was also evaluated in the edge of the landfill. VOC were adsorbed into multi-sorbent tubes and analyzed by means of TD–GC–MS.

Several potential scenarios were defined for the HHRA: 3 for the current situation and 4 for the future situation (recreative area with sorrounding buildings). USEPA methodology for HHRA was followed and toxicity values from IRIS database were used. Admissible risk was obtained in all scenarios due to low emissions. Effect of landfill on inmission air measurements was calculated to be negligible.

The use of direct mesurement of contaminants in air and emission fluxes allowed a more accurate HHRA with respect to the typical approach.

Enhancing the performance of GC-IRMS for small biomarker samples

DIETER JUCHELKA[1], JENS RADKE[2] AND ANDREAS HILKERT[3*]

[1]Thermo Fisher Scientific, 28199 Bremen, Germany (*correspondence: dieter.juchelka@thermofisher.com)
[2] Thermo Fisher Scientific, 28199 Bremen, Germany (jens.radke@thermofisher.com)
[3] Thermo Fisher Scientific, 28199 Bremen, Germany (andreas.hilkert@thermofisher.com)

The combination of Gas Chromatography with Isotope Ratio Mass Spectrometry (GC-IRMS) was introduced in 1988, opening the wide field of compound specific isotope analysis (CSIA). It combines the high purification efficiency of GC with the utmost precision of isotope ratio mass spectrometry.

Today compound specific isotope analysis of the main bioelements and their major isotopes ^{13}C, ^{15}N, ^{18}O and ^{2}H is a standard tool in many laboratories and is used in a wide range of applictions. Consequently, this analytical tool is extending into new areas of research, in which smallest sample size at high precision is a must.

The development of more sensitive IRMS systems with optimized GC combustion and high temperature conversion interfaces is also related with modern sample introduction techniques, choice of GC columns, advanced GC technology, conversion technology and interfacing to the IRMS as well as data handling. New challenges in sample size and separation concern the improvement of sensitivity and GC resolution combined with full automation for higher sample throughput.

We will discuss in this presentation the neuralgic points in the GC-IRMS system with application examples on biomarkers and other important biomolecules linked to improvements in sample introduction techniques, GC- and reactor technology.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.10