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Mathilde Mascles, Audrey Grandjean, Damien Bourgain, Jean-Philippe Amiet, Damien Bazin

Intitulé de l'exposé :

Développement et validation de systèmes analytiques pour l'analyse continue du formaldéhyde et comparaison à la méthode de référence

Title of the presentation:

Development and validation of analytical systems for continuous monitoring of formaldehyde and comparison to the reference method

Key words

Indoor air, Formaldehyde, Aldehydes, On-line Gas Monitoring, Portable instrument, Microfluidics, High-Performance Liquid Chromatography, Indoor air, Outdoor air

Issue

Indoor air quality monitoring is a growing concern since humans spend most of their time indoors. Many volatile organic compounds have been identified as air pollutant because of their negative impacts on human health. Aldehydes are of particular interest as they are irritants and have many sources in indoor air, mainly from construction materials such as plywood, insulating material or paints. Among them, formaldehyde, the most abundant one, is classified as carcinogenic under European Regulation (EC) and a limit of 30 µg/m^3 has been established for chronic exposure. Thus, there is a need for continuous, accurate, fast and robust analytical techniques for quantification of formaldehyde and/or aldehydes in air.

In this work, we present the results obtained on three different systems designed for the monitoring of formaldehyde and other aldehydes in ambient air. The first system is a transportable device based on the derivatization of formaldehyde followed by a continuous fluorometric detection. This system includes a new development for formaldehyde sampling based on a microporous tube. Ongoing continuous tests for more than 6 months to monitor indoor and outdoor air have demonstrated the system's excellent robustness and stability, as well as its capability to track variations in formaldehyde concentration at trace levels. This analyzer, equipped with an embedded multiplexing system, is capable of simultaneously quantifying formaldehyde in both indoor and outdoor air down to 0.1 µg/m^3. The second system is very similar to the first one in terms of its analytical components, but it is designed to be portable. It is more compact, has a battery autonomy of 4 hours and has a limit of detection of 1 µg/m^3 for formaldehyde. To validate all the results obtained with the microfluidic systems, a transportable high-performance liquid chromatography (HPLC) using 2,4-dinitrophenylhydrazine (DNPH) sampling tubes has been used. The system, designed to satisfy the requirements of the reference method ISO 16000-3, is equipped with a C18 column and a UV detector. This transportable HPLC-DNPH allows the quantification of at least 13 aldehydes down to ppt levels, including formaldehyde, acetaldehyde and hexanal. All three analytical systems vary in terms of complexity, portability and accuracy and are perfectly suited for the quantification of formaldehyde in ambient air.