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ABSTRACT BOOK

INFORMATION

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The Forum on Microcolumn Separations

CONTINUOUS MONITORING OF BIOGENIC VOLATILE ORGANIC COMPOUNDS IN AIR AT PPT-PPB LEVELS USING ONLINE GAS CHROMATOGRAPHY

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Volatile organic compounds (VOCs) contribute to the formation of tropospheric ozone in the lower troposphere via complex photochemical processes [1]. Many VOCs are emitted by anthropogenic sources (vehicle traffic, industry, etc.). Biogenic VOCs (BVOCs), such as terpenes are emitted by vegetation. Certain specific BVOCs can also be emitted by plants in the presence of pests and thus serve as tracers of their presence [2].

Measuring the temporal profiles of VOCs concentrations in the air at levels ranging from a few parts per trillion (ppt) to a few parts per billion (ppb) is of real interest for monitoring and/or understanding key atmospheric or physiological processes in plants. However, significant analytical constraints are imposed when trace-level BVOCs are monitored continuously. Online portable or transportable gas chromatography (GC) offers a simultaneous balance of these challenges.

The proposed analytical approach implies real-time sampling of BVOCs on an adsorbent bed, automated thermodesorption (TD), and injection into an analytical column (metallic MXT column) for separation, and then detection using ionization detectors, i.e., a flame ionization detector (FID), a photoionization detector (PID), or mass spectrometry (MS) [3-5]. Generation of reproducible BVOCs mixtures not readily available in pressurized cylinders becomes satisfactory when the system integrates dynamic calibration using permeation tubes.

To better highlight the possible applications, two transportable TD-GC-PID and TD-GC-MS with an integrated permeation setup were used to detect and quantify BVOCs over time. For example, TD-GC-PID was used to characterize BVOCs emissions from healthy and infested plants. Detection limits in the ppt level were achieved with reliable linearity and repeatability. During continuous field measurements, several analytical systems established the basis for a qualitative study of BVOCs biomarker emissions resulting from plant-pest interaction. Overall, different online continuous GC measurements demonstrate the potential of portable GC devices in environmental or ecological field-based applications.

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