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Determination of polar organic markers in atmospheric aerosols by gas chromatography–ion trap tandem mass spectrometry

A substantial fraction of the organic component of atmospheric particles consists of polar compounds, including carboxylic acids, sugars and phenols. They are used as reliable molecular markers to trace emission sources and environmental processes of the atmospheric PM. In light of the normally low concentration levels of these tracers in aerosol and the complexity of the environmental matrix, the reliable quantification of these compounds represents an analytical challenge, also because they are polar, semi-volatile, and somewhat reactive.

In this work a gas chromatography/ion trap mass spectrometry method has been developed and validated for the analysis of 27 polar organic compounds in atmospheric aerosol, namely low molecular weight carboxylic acids and methoxyphenols.

All the compounds were monitored in multiple reaction mode. For each target analyte the precursor ion and collision-induced dissociation voltage were carefully selected and optimized to produce daughter ion(s) and minimize interference during the analysis.

In comparison with the previous GC/MS procedure based on SIM detection, the MS/MS technique increased the analytical sensitivity by reducing detection limits for standard solutions from 0.6-2.6 ng μ l⁻¹ to 0.1-0.4 ng μ l⁻¹ ranges (concentrations in the injected solution). In addition, it enhanced selectivity by reducing matrix interferences and chemical noise in the chromatogram.

The developed method has been successfully applied to air quality monitoring campaigns in the Po Valley in different seasons, in the framework of the “Supersito” project. Methoxyphenols were quantified, although some were present in ambient air at 0.1-0.3 ngm⁻³ concentration levels, as unique markers of biomass burning to discriminate emissions from specific plant tissue combustion, i.e., hard woods or soft woods and grass.

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Working group IAS (WG1, WG2, WG3) o sessione speciale (SPR)

WG2

Tipo di presentazione (orale o poster)

Orale su invito

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