

Rapid On-Site Detection of Persistent Organic Pollutants Using a Mobile Mass Spectrometer

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Sensitive and selective identification of hazardous compounds such as chemical warfare agents (CWAs), explosives, environmental pollutants and other toxic industrial compounds and materials (TIC) has become a necessity in many applications. Gas chromatography combined with mass spectrometry (GC-MS) is the standard laboratory method for the identification of such kind of chemical substances in complex environmental matrices. To save time, field deployable sensors are preferred because valuable time, resources and chemical information are preserved performing analyses directly in the field.

Here we present the mobile mass spectrometer E²M combined with the air/surface probe, enabling fast on-site detection and identification of widespread, toxic and persistent organic pollutants (POPs) like polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) in complex soil samples. For these analysis real, contaminated soil samples with known and certified concentrations for PAH's (1 to 13 mg/kg; depending on PAH) and PCB's (0.5 to 3 mg/kg depending on PCB) were used. The PAH's are identified within groups with the same mass fragments and the PCB's are identified in groups within the same number of Cl atoms. The analysis is completed within minutes and without any sample preparation. Results are obtained just by pressing the heated probe head on the contaminated soil or surface. Depending on the volatility of the substance results are present after some seconds up to minutes. For rough separation of the PAHs and PCBs a temperature ramp is programmable for the probe line of the air/surface probe, so that the device works like a little GC. This enables a more detailed analysis of the signals in the "chromatogram".