Improving the Quality and Productivity of Environmental Extraction

Milestone Inc.

Microwave-assisted extraction technology offers multiple benefits over traditional Soxhlet extraction and other non-conventional systems. ETHOS X with its new FastEX-24 rotor and disposable glass vials offers reliable extraction of contaminants from soil in compliance with EPA 3546 along with easy handling and high extraction efficiency.

The extraction of contaminants, such as PCBs, semivolatile organic compounds, and PAHs, from soils requires solvent extraction. Microwave-assisted extraction (MAE) overcomes the limitations of Soxhlet extraction, resulting in rapid sample preparation with reduced amounts of solvents while working at higher temperatures and pressures. The process is a partitioning of the compounds of interest from the sample matrix into the solvent within a closed vessel. EPA 3546 method provides guidelines to work with the MAE technology, thus improving the quality and the productivity of environmental laboratories.

Instrumentation

Milestone's new ETHOS X microwave extraction system can extract organic target compounds from soils, in full compliance with EPA 3546 (100–115 °C and 50–150 psi). Disposable glass vials and contactless temperature control in all positions makes the Milestone ETHOS X with the FastEX-24 rotor a unique and innovative solution for the extraction of contaminants from soils, providing unmatched ease of use and low running costs. The ETHOS X is capable of processing up to 30 g of sample per vessel (up to 24 samples simultaneously), thereby improving the limit of quantitation (LOQ) for analysis. The handling is very easy as the sample is weighed directly into the disposable glass vial, hexane/acetone or CH_2Cl_2/acetone (1:1) is added, and the vessel is loaded into the FastEX rotor. After 10–20 min of microwave heating, the sample is ready to be filtered and analysed by gas chromatography.

Table I: Efficiency of PCB extraction evaluated on multiple LCS samples spiked at 20 mg/L; analysis by GC–MS.

Target compounds	Recovery (%)	RSD % (n=4)
Tetrachloro-m-xylene	88.5	3.6
Decachlorobiphenyl (DCB)	93.4	4.5

Table II: Efficiency of semivolatile organic compounds extraction evaluated on multiple LCS samples spiked at 50 mg/L; analysis by GC–MS.

Target compounds	Recovery (%)	RSD % (n=4)
2-Fluorophenol	89.3	2.3
Phenol-d5	90.1	4.8
Nitrobenzene-d5	81.3	3.5
2-Fluorobiphenyl	87.3	4.2
2,4,6-Tribromophenol	96.4	1.8
p-terphenyl-d14	98.2	3.4

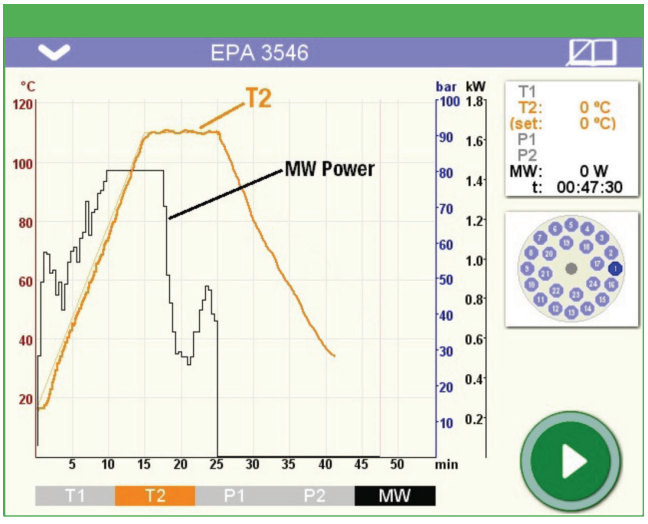

Figure 1: ETHOS X extraction program with 24 × 15 g dried soil samples. The line T2 shows the actual extraction temperature achieved.

Figure 2: ETHOS X system equipped with the FastEX-24 rotor incorporates Weflon™ sleeves and disposable glass vials to ensure maximum productivity.

Conclusion

The ETHOS X enables simultaneous solvent extraction of up to 24 samples (from weighing to filtration) in only 40 min. This results in the capacity to extract over 200 samples in an 8-hour workday. Contamination, memory effects, and cleaning are eliminated due to the use of disposable glass vials. The use of contactless temperature control ensures high reproducibility and full recovery of the target analytes for full compliance with EPA 3546. The ETHOS X with all its features, fully addresses the needs of environmental laboratories in terms of productivity, ease of use, running costs, and extraction quality. The ETHOS X equipped with the FastEX-24 rotor provides superior extraction capability for easier analysis.

Milestone Inc.
25 Controls Drive, Shelton, CT 06484
tel: (866) 995-5100, fax (203) 925-4241
Website: www.milestonesci.com