Automated Solid Phase Extraction (SPE)  
**FREESTYLE**

The FREESTYLE SPE Module - An Ingenious Principle

In almost every analytical laboratory, samples are routinely cleaned via SPE columns in order to obtain clean solutions for subsequent analysis or analyte concentration. The automation is the perfect solution to simplify these routine working steps, to obtain the reproducibility of the results, and to receive good recoveries.

The FREESTYLE SPE has unique possibilities for sample preparation using solid phase extraction (SPE). Each manual SPE method which has already proven of value in the laboratory can be automated in a quick and easy
manner. The application fields are wide: from mycotoxin and environmental analysis up to forensic applications and samples of doping control.

Positive pressure makes the difference

The most important feature of the FREESTYLE SPE module is the solid connection of the SPE column with the robotic arm that grippes the SPE-columns air and liquid tight. The robotic arm is connected with the injection pump and valve system via an integrated tube. This unit enables the SPE columns to be moved to any place on the platform and opens up completely new possibilities of automation, i.e. for loading or elution.

In addition this connection allows controlled pressure application of up to 4 bars. With this positive pressure many samples can be pushed through the columns, which otherwise would block the columns due to their viscosity or the suspended particles contained therein.

In such a closed system, permanent pressure control can take place during loading and elution of a sample. Sample processing will be terminated if pressure is exceeded; the unit cleans itself and then continues with the next sample. Long sample sequences can thus be processed during the night without the danger of the system being blocked and awaiting remedial action. FREESTYLE marks the problematic samples in the sequence list, which the user can easily identify and then process again.

Due to the tight connection, the flow rates can be controlled very accurately. This is particularly important for a precise elution.
No cross-contamination
Due to the design of the system and its special selected components, like valves and needle, as well as the integrated cleaning steps, cross-contamination is reliably avoided.

Flexible – Even in Details

Flexible column formats in one single rack
FREESTYLE SPE handles diverse SPE columns from 1 to 15 mL. Reusable adapters facilitate an easily changeable and mixed configuration for all column types, such that only one single universal rack is needed.

The bandwidth of usable columns ranges from the 1mL SPE column to large-volume glass columns:

- All SPE columns 1 mL, 3 mL, 6 mL up to 15 mL
- All standard immunoaffinity columns (1 mL / 3 mL)
- Glass columns for maximum dimensions of 105 x 17.5 mm inr. D, ca 19 mL

Flexible sample loading
Many different possible applications arise through the very flexible sample loading: from large-volume of up to 100 mL in mycotoxin analysis to only a few µL e.g. in forensics.

FREESTYLE technology offers a suitable solution for each application that can be simply selected from the software during the method set-up.
Sample loading of large-volume samples

These samples (up to ca. 100 mL) are ideally sucked via the needle (first z-axis) into the sample loop (potentially several times) and then loaded onto the SPE column (second z-axis).

Loading of small-volume samples (e.g. 500 µL)

The column is conditioned and positioned in the wash port. There, the small sample volume (e.g. 500 µL) is directly pipetted with the needle onto the column. The SPE unit then takes up the column and the process continues.

Loading and direct/parallel discharge of sample

Samples of up to 60 mL can be loaded directly onto the SPE column via the
Flexible elution
Elution from the SPE column can be performed in many ways. Even quite complex elution procedures can be realised. The different procedures are stored as a macro in the software and can thus be easily integrated into a method. A selection of various racks facilitates elution into different containers, e.g. into a 2 mL or 5 mL volumetric flask, when a defined end volume is required.

Standard procedures

Elution with one solvent into one container
Elution with several solvents into different containers

Special procedures

Elution with one solvent into several containers of the same size (up to 10 containers). Each vial is filled to its maximum before the next vial is filled.
Elution with several solvents into one container

Only the FREESTYLE makes it possible

The sample can be eluted directly into the EVAporation chamber with subsequent concentration and if required including a solvent exchange. After the EVAporation the sample can be filled into a GC vial, ready for subsequent analysis. Alternatively the sample can be directly injected from the EVAporation chamber into the HPLC via the FREESTYLE Direct Injection module enabling the complete automation of the process. The result is a ready chromatogram.

Sustainable, Intuitive Software

The clearly arranged software with elaborate colour code allows for method creation at the PC - this means that nearly any manual method can be directly transferred to an automated process.

For this purpose the individual steps can be selected within a method per drag & drop and used in any combination and repetition. Simply by moving bars, parameters such as volume or speed can be adjusted. For your control, the value will be displayed as a figure.

The FREESTYLE software is included in the basic price of the system and will be continually developed. Updates as well as upgrades are always free of charge.
Some Application Examples

Steroids in animal food
Due to a modification of the FREESTYLE software, two Solid Phase Extractions ("Dual-SPE") with different column formats can be processed automatically one after another. Plungers specially developed to reduce the dead volume of the SPE-columns to a minimum lead to higher flow rates and reduce the process time per sample.
Forensic investigations
Even very difficult matrices, like brain or similar matrices, can be processed automatically with the sample loading of the bidirectional SPE (solid phase extraction) without supervision over 24 hours and 7 days per week. Due to the unique procedure the sample never enters the robotic system, so cross-contamination can be excluded.

Mycotoxin analysis
Tedious tasks are not a problem for the FREESTYLE system. These tasks are processed reliable and consistently during day, night and over the weekend. In addition to LCTech’s immunoaffinity and SPE columns the FREESTYLE SPE can be used for all types of mycotoxin columns of leading manufacturers.

H53 method
In combination with the EVaporation module the FREESTYLE SPE carried out the complete clean-up for analysis of mineral oil hydrocarbons: extraction, concentration to 1 mL and filling of the prepared sample into GC vials. Of course the process steps can be operated separately.

For the clean-up steps we recommend the competitive Florisil columns Elufix.
Suspended particles in river water
Suspended particles in water can easily clog or block the surface of a SPE column. In most instances FREESTYLE pushes these suspended particles controlled through the column using 4 bar of positive pressure. The kind of elution is freely selectable. Large sample volumes from 1 L up to 10 L can easily be automated with the robotic system for water analysis FREESTYLE XANA.

High throughput in doping control
Urine samples from racing horses are difficult to handle, because the column might be blocked due to the viscosity of the sample. Pressure control alone is not enough. The FREESTYLE software has an excellent solution: Should a column block because of the urine properties, the processing will be terminated, the sample will be marked in the sequence list and the system resumes with the processing of the next sample! Such features realise the end-to-end automation without downtime.

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Brochures
General FREESTYLE brochure (pdf)
| 2.7 MB
FREESTYLE SPE forensics &
Video

FREESTYLE SPE - Automated solid phase extraction (SPE)

Application notes

Determination of the hydrocarbon-index (H53-method) (pdf | 1.7 MB)

Determination of PAH in particulate matter with SPE/EVAporation (pdf | 879.6 KB)

Automated Determination of Aromatic Amines from Azo Colorants According to DIN EN ISO 17234-1 (pdf | 2.2 MB)

THC metabolites in urine (pdf | 1.3 MB)

Automated detection of acrylamide in water (pdf | 1.4 MB)

Automated detection of chloramphenicol in honey (pdf | 1.5 MB)

Bidirectional SPE

New sample loading for difficult matrices in the field of forensic and toxicology.
Dual-SPE
Two solid phase extractions are operated automatically within one method by FREESTYLE SPE.