Images: GERSTEL / Wolfram Schroll

Automated Liquid-Liquid Extraction (LLE)

Speeding up the workflow …

In addition to SPE workflows, the GERSTEL MultiPurpose Sampler (MPS) can perform fully automated liquid-liquid extraction. Several functionalities can be added as modules.

By Oliver Lerch

An important stepping stone on the path to improved productivity is the automation of manually performed sample preparation steps. Whether these can be transferred to an automated sampler system of course depends on whether the sampler has the individual capabilities needed to perform each step in the process. Multiple application examples have been reported over the years using the GERSTEL SPE system based on the MultiPurpose Sampler (MPS) [1, 2].

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Suggested reading

Determination of THC and its metabolites 11-hydroxy-THC (THCOH) and 11-nor-9-carboxy-THC (THC-COOH) in blood serum
K. Purschke, S. Heinl, O.Lerch, F. Erdmann, F. Veit, Anal Bioanal Chem, DOI 10.1007/s00216-016-9537-5
Link: http://link.springer.com/article/10.1007/s00216-016-9537-5

Recently, a similar effort has been under way to automate several aspects of and complete workflows for liquid-liquid extractions (LLE).

Application examples include determination of Tetrahydrocannabinol (THC), the active compound in cannabis, and the cannabinoids cannabinol (CBN) and Cannabidiol (CBD) all in human hair (A scientific publication has been accepted by the Journal of analytical Toxicology). In addition, an article on the determination of THC and its metabolites 11-hydroxy-THC (THCOH) and 11-nor-9-carboxy-THC (THC-COOH) in blood serum has been published in the Journal of Analytical and Bioanalytical Chemistry [3]. The GERSTEL GC/MS-solutions configured for those applications are being used successfully by Forensic Toxicology Institutes. In addition to these more special analyses, a much wider array of applications require liquid-liquid extraction. All steps required in such a process can be automated using the GERSTEL MPS. Key elements in such systems are the CF 200 centrifuge, the MultiPosition Evaporation Station (*m*VAP) and *quick*Mix. The only step that must be performed manually is the addition of the liquid or solid sample into a vial and placing the vial in the MPS sample tray. All other steps are performed automatically. The analytical method and sample sequence is simply set up with a few mouse-clicks using GERSTEL MAESTRO software.

GERSTEL MultiPurpose Sampler (MPS) equipped with centrifuge, *m*VAP and *Quick*Mix.

The MPS adds internal standards to the sample followed by extraction buffer and extraction solvent. The extraction is performed in a few minutes while the MPS agitates the sample vigorously in the quickMix ensuring thorough mixing. The phases can then be separated efficiently using the CF 200 centrifuge, or alternatively, a more powerful Sigma® centrifuge. The MPS aspirates the extract and transfers it to a clean vial. As needed an additional extraction step is performed using a new volume of clean solvent. Depending on the analytical workflow requirements, the MPS can inject an aliquot of the resulting extract into the analysis instrument or evaporate it to dryness in the *m*VAP. If evaporated to dryness, the residue can then be taken up in an HPLC compatible solvent with the option of adding a derivatization reagent. The steps to include in the final workflow are totally up to the user. These examples show how the MPS can be used as a highly flexible and rugged tool for automated liquid-liquid extraction processes. An additional application example based on veterinary samples can be found online [4].

References

[1] www.gerstel.com/en/apps-spe.htm
[2] www.gerstel.com/en/Solutions-Articles-SPE.htm
[3] K. Purschke, S. Heinl, O.Lerch, F. Erdmann & F. Veit, Anal Bioanal Chem, DOI 10.1007/s00216-016-9537-5 Link: http://link.springer.com/article/10.1007/s00216-016-9537-5
[4] www.gerstel.com/pdf/p-lc-an-2014-07.pdf