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## Introduction

A concentration technique has been proved necessary for lowering the detection limits of advanced toxicity bio-monitors [1]. Further analysis of toxic samples with high-resolution mass spectrometer is used when an alarm is triggered. This study aimed to the development of a fully automated method based on on-line solid phase extraction (SPE) tandem Q-TOF liquid chromatography- high resolution-mass spectrometry analysis (LC-HR-MS) (Agilent, The Netherlands) for the concentration and determination of 257 polar compounds, including pharmaceuticals, pesticides and industrial compounds, spiked in drinking water samples. The developed extraction method should be applicable in concentrating aqueous environmental samples as a pre-treatment step prior to toxicity monitoring and if necessary followed by LC-HR-MS screening.

## Methodology along with Results

**First step:** Determination of the most efficient SPE material for recovering the maximum of the compounds (recovery > 25%).

**Table 1:** 13 SPE materials tested with Symbiosis™ system (Spark, The Netherlands).

### Symbiosis™ SPE materials

Oasis® HLB  
 HySphere Resin-SH  
 HySphere Resin-GP  
 HySphere C18-HD  
 HySphere C8-EC-SE  
 HySphere MM Anion  
 HySphere MM Cation  
 HySphere C2-SE  
 HySphere CN-SE  
 PLRP-s  
 XB 55  
 XB 96  
 Isolute® NH2

## References

[1] Penders E.J.M., 2011. "Development of aquatic biomonitoring models for surface waters used for drinking water supply". Ph.D. Thesis, Wageningen University, Wageningen, The Netherlands.

## Acknowledgements

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## Discussion- Conclusions

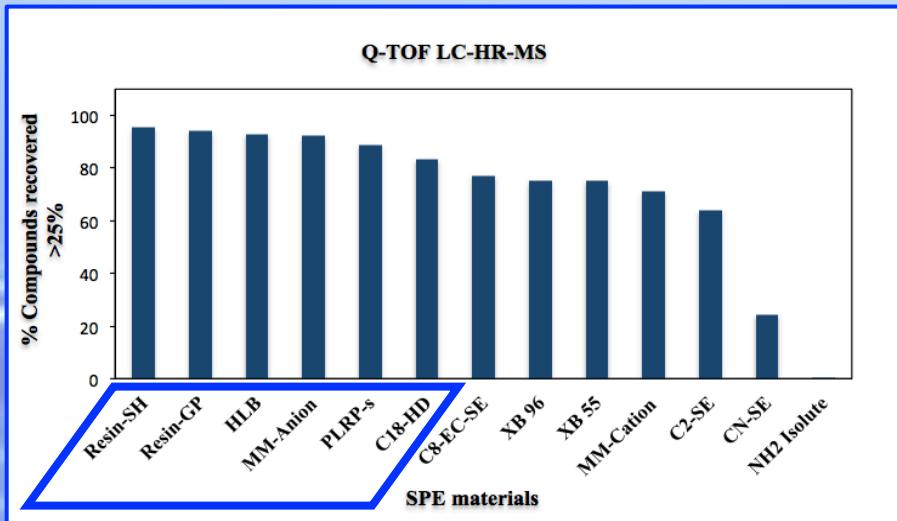
An extensive study has been performed in order to identify the most efficient combination of SPE material and pH for retrieving the maximum of the tested polar compounds

Advanced laboratory equipment was applied for this research for developing a generic concentration method for polar compounds. Initially, the results demonstrated that Resin-SH, Resin-GP, Oasis® HLB, MM-Anion, PLRP-s and C18-HD were the most efficient materials.

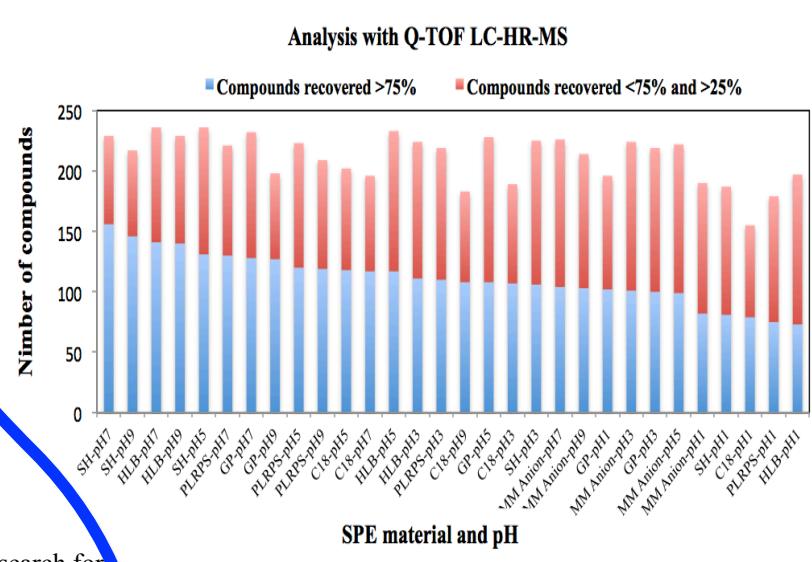
The combination of material and pH showed that Resin-SH and Oasis® HLB at pH 5-7 were the most suitable combinations for recovering the maximum of the tested compounds. However, there was a small number of compounds that recovered in higher percentages when low pH was applied.

The development of this method with a broad applicability to such a great range of compounds improves the potential of its integration to online toxicity biomonitoring. Consequently, lowering the detection limits of biomonitoring will result in receiving better early warning alarms.

**Second step:** Choice of the 6 best SPE materials out of 13.



**Figure 1:** Compounds (%) being recovered at higher than 25% for each material applied in Symbiosis™.

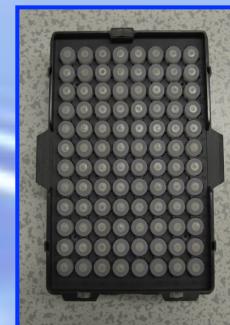


**Figure 2:** Number of compounds being recovered out of 257 at a percentage between 75% and 25% for each material applied in Symbiosis™ at the specific pH values (Table 2).

**Third step:** Application of different pH values using the 6 most efficient SPE materials.

**Table 2:** Selected SPE materials used for Symbiosis™ online system at different pH values

Symbiosis™ SPE materials	pH
HySphere Resin-SH	1,3,5,7 and 9
HySphere Resin-GP	
Oasis® HLB	
HySphere MM Anion	
PLRP-s	
HySphere C18-HD	



**Picture 1:** Symbiosis™ cartridge holder.