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Project :	Speeding up quality control of Traditional Chinese Medicine by the application of microreactors	
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Fields of interest:	Sample pre-treatment; Microreactors; Induced phase separation extraction;	
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Introduction

Traditional Chinese Medicines (TCMs) may contain ten different plants with each 100 compounds, it is difficult to separate all compounds at a time, so sample pre-treatment which can greatly facilitate the later high-resolusion analytical separation by HPLC or LC is absolutely mandatory and an unavoidable part of quality control (QC) of TCMs. However, sample pre-treatment is a low-resolution separation of a crude extract into different classes of molecules based on e.g. their polarity or acidity, and is difficult to automate. It often takes up more than 60% of the total analysis time and is a major source of error.

Goal

The aim of this topic is to speed up quality control of TCMs by applying two new microreactor-based forms of sample pre-treatment. One is based on the 2- or 3-phase chip see (Figs. 1). This is a totally new approach and if it can be further developed and used.
The other application is based on a rapid and complete solvent-induced phase separation extraction (IPSE)(1). It works by adding hydrophobic organic solvent or a buffer to a mixture of water and an organic solvent, creating suddenly two phases (Fig. 2). IPSE gives high yields and can separate different classes of compounds. For the first time we aim to realise this in a microreactor cutting down on solvent use, time and human manipulations.

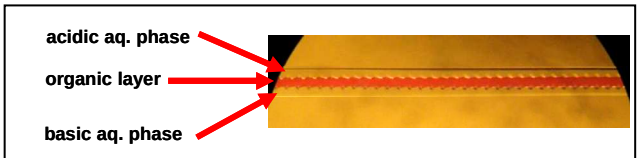

Fig. 1. Working 3-phase chip (with dye added to organic layer for photo)

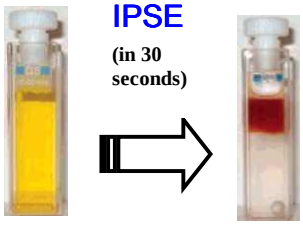

Fig. 2. Fast transition of one homogenous phase to two separate layers with different compounds.

Progress achieved

In this project, the first microreactor, a stable 3-phase chip, has been successfully established to purify plant base (alkaloids). It consumes minute amounts of sample and solvent (µL) and is fast (< 1 min) (Figs 3)(2).

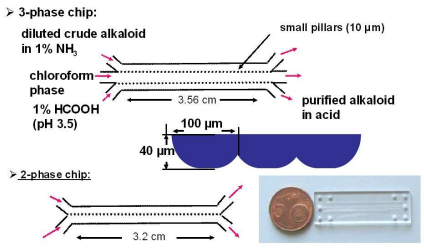

Fig.3. Lay-out of 2- and 3-phase chip (2x top view, 1x side view (dark blue) and real photo next to 5 Eurocent coin (2).

The study of IPSE for *Scutellaria bacalensis* Georgi found that the constituents in the organic phase are all flavonoid aglycones while all flavonoid glycosides are in the aqueous phase, which reveals the property of high structure selectivity for the proposed IPSE process (3).

Further research

For the first microreactor, we are focusing on optimization and expansion, and trying to do on-line combination with extraction, separation(nano HPLC or CE) or identification techniques(MS), and quantitative aspects.
A new microreactor consists of a micro-mixer and a 2-phase channel will be used for IPSE. An extract in two miscible solvents (water/acetonitrile) is introduced at one end, either water with salt or a hydrophobic solvent is added, phase separation occurs, followed by separation of the two phases at the end of the chip each containing certain compounds. Then analysis of either or both phases (off-line or on-line) follows. Once having achieved stable phase separation and extraction, we also will do some on-line combination work with other equipments.

Acknowledgement

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References

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