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VUB Technology Offer - CHIS

'Pushing the boundaries of UHPLC analytical technology'

Demands for increased analytical separation power

UHPLC instruments are now available from every major LC and LC/MS vendor, and represent a significant and growing fraction of total HPLC systems. The latest drastic improvements in HPLC technology (the availability of sub-2-µm column particles and the introduction of Ultra High Pressure pumps up to 1300 bar) have thoroughly stretched the boundaries of HPLC technology. Today, the separation performance is limited on a fundamental level by viscous heating effects: when pushing the column operating pressures to the maximum of currently available ultra-high pressure levels and beyond, part of the separation capacity is undone because of viscous heating and temperature profiles inside the column. But modern industry and society continues to demand cheaper, easier and increased analytical separation power...

The Chemical Engineering Department (CHIS) of the Vrije Universiteit Brussel (VUB) offers a new solution to answer these demands.

Keywords

analytical separation technology
UHPLC
viscous heating
temperature variations
separation
columns

Splitting up a column into several fragments

In order to get past the viscous heating effects encountered in state-of-the-art Ultra High Pressure Liquid Chromatography, **the separation column is split into several segments and active cooling is placed onto the capillaries connecting the column segments.** This approach has been proven *(Broeckhoven et al., 2010)** to lead to a **decrease in temperature rise of over 40%** in a 15 cm column on existing UHPLC equipment (Figure 1), and **a much improved peak resolution** (Figure 2). When changing method parameters, **the equilibration time of the system is reduced by 50%** (see Figure 1).

* K. Broeckhoven, J. Billen, M. Verstraeten, K. Choikhet, M. Dittmann, G. Rozing, G. Desmet, J. Chromatogr. A 1217 (2010) 2022.

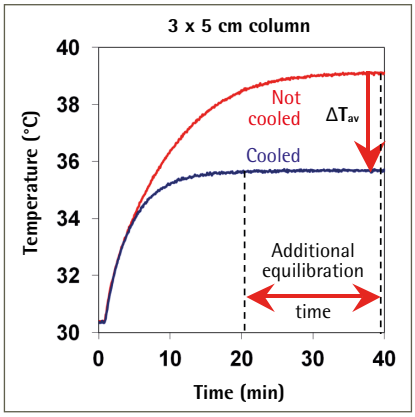

Figure 1:

Temperature evolution at end of last column segment for a coupled column system without (red curve) and with (blue curve) active cooling when switching the flow rate from 0.15 to 0.6 ml/min (45/55% (v/v) ACN/H_2O mixture at 30°C). Notice the temperature decrease and gain in equilibration time.

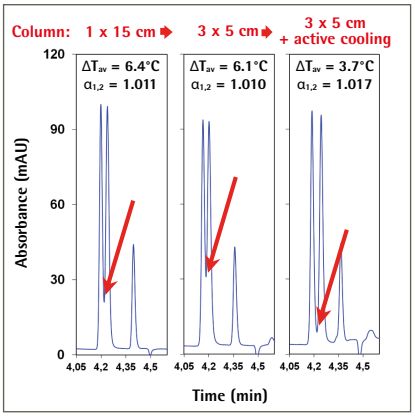

Figure 2:

Chromatographic separation of three impurities: (a) the observed results on a 15 cm long column with flow rate 0,6 ml/min, (b) the chromatogram at the same flow rate for 3 coupled 5cm column segments without active cooling and (c) the same experiment but now with the active cooling. Observe the decrease in temperature rise (ΔT_{av}) and the increase in peak resolution of the crucial pair ($\alpha_{1,2}$).

Technology Transfer Interface Brussels

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Innovation with competitive advantages

This technology

- has **advantages** proven with existing commercial equipment - **over 40% decrease in temperature rise and 50% reduced equilibration time** - and even more beneficial effects on higher pressure equipment;
- will help your end-users to transfer their methods **from a low to a high pressure system**;
- is compatible with the current production technology; implementing the patented technology means **low production cost**;
- requires no or **minimal development time** before commercial implementation of the patented technology.

Market opportunities

We are looking for industrial partners interested in licensing **the patented technology:** producers of complete (U)HPLC system, manufacturers of columns for (U)HPLC system, producers of active-cooling elements.
Allthough we feel this technology has an inherent low risk, we are **open for collaborations** and discussions on de-risking the implementation of this technology in a commercial production process and proving the value of this technology - how far we can push the limits.

IP Status

Patented application pending:
EP 2411109 / US 2012/0011921 by Vrije Universiteit Brussel: "Method for improving the efficiency of high-pressure liquid chromatography".

Interested parties can contact

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