

SFC 2008 Conference Report

by Monika Johannsen

The 2nd Annual International Conference on Supercritical Fluid Chromatography (SFC 2008) chaired by Professor Larry Taylor (Virginia Tech University, Blacksburg, Virginia, United States) was held on October 1-2, 2008 in Zurich, Switzerland. Scientific Organizing Committee members were Monika Johannsen (Hamburg University of Technology), Eric Francotte (Novartis), Didier Thiebaut (Ecole Supérieure de Physique et de Chimie Industrielles (ESPCI)), J. David Pinkston (The Proctor & Gamble Company), Frank Riley (Pfizer Inc). Ms. Michelle Besanceney of the Green Chemistry Group was the conference manager. The Green Chemistry Group is a non-profit organization dedicated to the advancement of environmentally sustainable chemical research and development throughout the world.

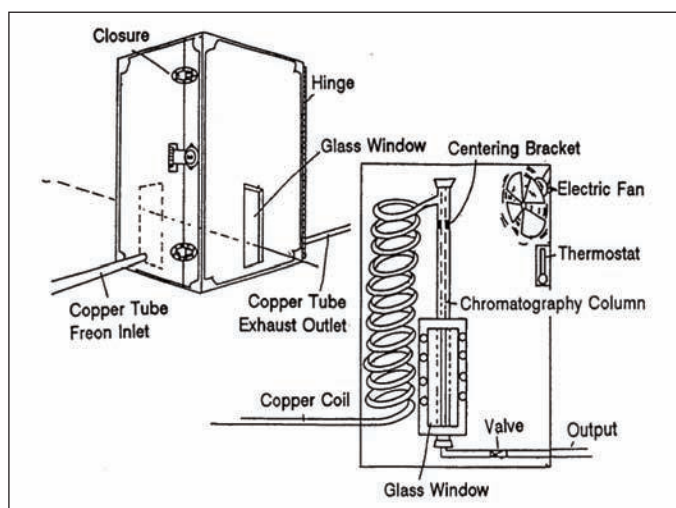


Fig. 1: First Supercritical Fluid Chromatograph [Klesper, 1962]

The SFC 2008 Conference was attended by about 135 participants from more than 21 countries in Europe, Asia, North America and Australia. The conference program included scientific presentations, an exhibition and poster session that stimulated the advancement of supercritical chromatography as a "green" alternative to traditional separation techniques.

After a charming welcome from senior member James Waters, J. David Pinkston (The Proctor & Gamble Company) opened the scientific presentations with an overview of past (Fig. 1) and present of SFC and concluded that SFC is one piece of the solution for sustainability for the future.

Dauh-Rurnh Wu (Bristol-Meyers Squibb) focused on chiral separations in drug discovery from analytical to multigram-scale and showed that SFC is a powerful technique for larger scale chiral separations. Larry Miller (Amgen, Inc.) discussed co-solvent injection instead of mixed stream injection for preparative injections as well as the effect of co-solvents on SFC chiral resolution and analytical efficiency.

Eric Francotte (Novartis) gave an overview on most used chiral stationary phases (CSP) in HPLC and SFC and presented an immobilization

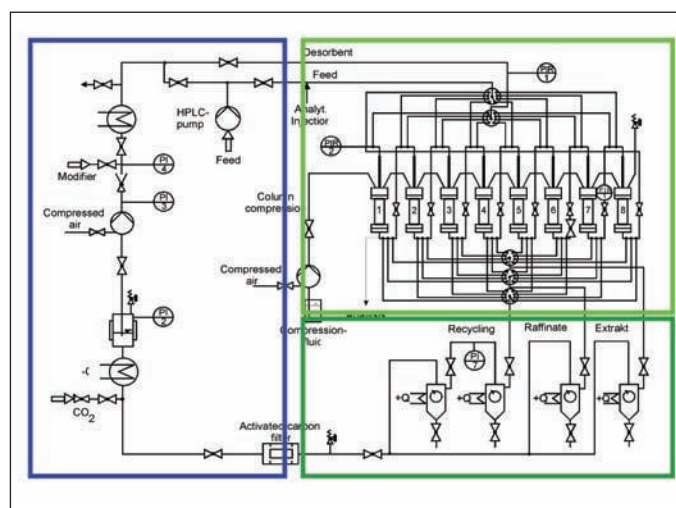


Fig. 2: SMB-SFC at Hamburg University of Technology: 30mm I.D. axial dynamic compressed columns [Johannsen, 2008]

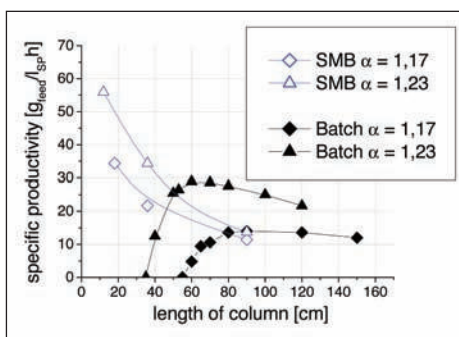


Fig. 3: Specific productivities batch-SFC vs. SMB-SFC ($N_{th} = 2500$ m-1, $u_{max} = 0.84$ cm/s; SMB column configuration: 1/2/2/1 [Johannsen, 2008])

concept for the improvement of commercial CSPs with regard to their solvent stability. Monika Johannsen (Hamburg University of Technology - TUHH) presented a preparative batch-SFC (3 cm i.d. column) and a continuous SMB-SFC with up to 8 columns (Fig. 2) built at TUHH. For different applications she showed the process development (Fig. 3) including an economic evaluation and summarized that SFC in preparative scale is ready for broad application in chemical and pharmaceutical industry. Ng Mei Han (Malaysian Palm Oil Board) showed the implementation of pilot scale SFC (35 cm i.d. column, Fig. 4) for the separation of palm phytonutrients, e.g. carotenoids, tocopherols and sterols, complementing the palm biodiesel production.



Fig. 4: Pilot scale SFC at Malaysian Palm Oil Board: 350mm I.D. column, 600 kg CO₂/hr (max), Co-solvent pump : 40 L Co-solvent/hr (max) [Ng, 2008]

Jimmy DaSilva (Schering-Plough) stated that preparative SFC can help to speed up the process development efforts of pharmaceutical candidates and showed the great solvent reduction due to SFCs fast run times for both analytical and preparative scale. Frank Riley (Pfizer, Inc.) discussed the impact of packed column SFC on project progression from drug discovery through development. Ying Wang (Novartis) discussed the application of SFC for high throughput purification in natural product drug discovery and stated that SFC opens a new dimension in natural product purification.

In a vendor workshop Warren Potts (Waters Corporation) introduced different ionisation techniques in SFC-MS like Electrospray Chemical Ionisation (ESCI), Atmospheric Pressure Chemical Ionization (APCI) and Atmospheric Pressure Photoionization (APPI) that can be applied in SFC.

David Corens (Johnson & Johnson) presented an automated chiral SFC-MS method development with column and solvent switching and stated that preparative chiral SFC is the method of choice (instead of HPLC with 10fold solvent consumption). A mass triggered preparative SFC is of great interest but available instruments are still insufficient to date. Ray McClain (Merck and Co., Inc.) proposed mass directed SFC in support of medical chemistry due to lower solvent consumption and faster purifications.

Didier Thiébaud (Ecole Supérieure de Physique et de Chimie Industrielles (ESPCI)) presented Ultra High Performance / High Pressure Supercritical Fluid Chromatography on columns packed with particles smaller than 2 μm (Fig. 5). Pressure drops up to 40.0 MPa and high flow rates were applied which led to short retention times.

Finally, the applicability of SFC for separation of amine salts, phospholipids and polypeptides were presented by Larry Taylor (Virginia Tech University). In order to expand the SFC sample base to more polar and ionic compounds additives like sulfonates or amines were used.

Polywax 655

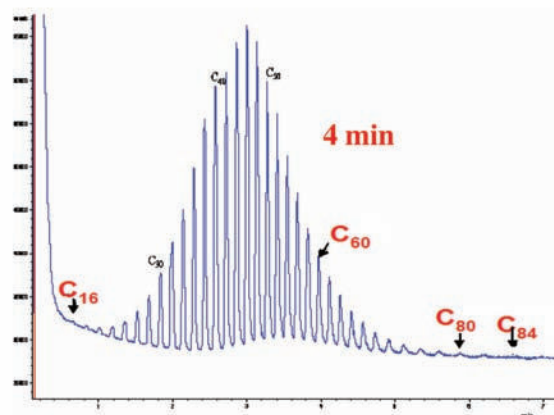


Fig. 5: UHPSFC of alkanes: $D = 2\text{mL/min}$, $T = 100^\circ\text{C}$; pressure gradient from 80 bars to 300 bars at 99 bars/min, column Nucleodur Gravity 5cm x 0.3cm, 1.8 μm ; FID [Thiébaud, 2008]

In the session breaks the poster session and the vendor exhibition provided great opportunities for the conference delegates to discuss with each other or with the number of different vendors and become acquainted with the latest developments in SFC application and equipment from the analytical/lab scale up to the production process scale (including new stationary phases). Several instruments in different scales are now commercially available from Thar Instruments, Inc., PIC Solution, Novasep, and JASCO. All in all, the conference participants obtained a broad global perspective on advances and opportunities in supercritical fluid chromatography as a "Green Technology". In the end conference participants were invited to enjoy a scenic dinner cruise capturing the beauty of Zurich. The 3rd International Conference on SFC organized by the Green Chemistry Group will be held at the Radisson Plaza - Warwick Hotel in Philadelphia City Center, Pennsylvania, USA, on July 22 – 23, 2009. (For details, see <http://www.greenchemistrygroup.org>).

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