Made in Switzerland

25 years of Swiss Ion Chromatography

Metrohm is a well-established company in the field of ion analysis. Back in 1948, it manufactured the first pH meter. Not quite so long ago, the company also moved into ion chromatography. The achievements in its services to users are all the more important: any user can perform ion chromatographic analyses successfully!

The First Swiss Ion Chromatograph

Following the successful launch of an electrochemical HPLC detector in 1981, a conductivity detector was developed in 1983. Very soon the development team realized that this task was achievable, but to obtain a stable baseline and low detection limits, the entire analytical system had to be optimized – from the high-pressure pump through capillaries to the separation column. In 1987, Metrohm presented its first ion chromatograph, the "690 Ion Chromatograph".

This instrument combined an injector (manual sample injection), separation column, detector, and control electronics in a single housing and relied on single-column ion chromatography with electronic suppression. It proved that ion chromatography (IC) can be successful even without chemical suppression. For better or worse, a decision had to be made in favor of electronic suppression, because chemical suppression was at that time protected by patents and therefore not available. Although originally a hurdle, this might be precisely the reason why the conductivity detector is still the best on the market.

Why Use IC at All?

IC offered crucial advantages over photometry, which was widely used at that time: with IC, it was possible, for example, to analyze a sample consisting of seven different anions within a few minutes, whereas photometry took hours to determine just a single anion!

Modular Ion Chromatography

In 1996, with the 700 series, a modular ion chromatograph was developed that had a lasting effect on IC. The simplest configuration consisted of a 709 IC Pump, 732 IC Detector (conductivity detector) and 733 IC Separation Center with permanently fitted Metrohm Suppressor Module "MSM" (fig. 1).

In the meantime, access to chemical suppression was gained and it was combined with the conductivity detector, thereby achieving the lowest detection limits.

As an optional two-channel instrument, the modular ion chromatograph could be used for simultaneous determination of cations and anions. The integration of numerous extension modules opened up new applications. Many of the tasks that had previously been done manually were automated – with positive effects also on reproducibility. One of the first

Walter Terzer and Markus Läubli, the Developers of the 690 Jon Chromatograph.

Fig. 1: Metrohm's first modular ion chromatography system with the 733 IC Separation Center

extension modules, the 754 Dialysis Unit, allowed to separate particles, colloids, and further disturbing matrix compounds from the analytes. This made it possible to analyze fruit juices, soil samples, slurries, etc. with ion chromatography without risking blockage of the separation column or a shorter column life.

Compact, Versatile, and Economical

In 1999, the 761 Compact IC was presented. The first compact ion chromatograph combined a maximum amount of IC (injection valve, double-piston pump, suppressor module, high-performance detector, peristaltic pump, electronics for data processing and a variety of separation columns) in minimum space. It was as efficient as the modular ion chromatograph and also produced top-quality analytical results. The 761 Compact IC was followed by other compact instruments, such as the 790 Personal IC and the 792 Basic IC.

The Modular Advanced Ion Chromatographs

In 2003, the focus was on the modular "Advanced Ion Chromatographs". Existing modules and the software were modified for the Advanced series and upgraded with many optimizations and extensions, such as a permanently fitted column oven and the CO_2 suppressor. Liquid handling, sample preparation techniques, and also automation of analysis were developed further.

Intelligent Ion Chromatography

New standards in IC were set in 2007 with intelligent ion chromatography and the introduction of the ion chromatograph 850 Professional IC (fig. 2), iColumns (intelligent separation columns), 858 Professional Sample Processor (versatile sample changer), 872 Extension Modules, and MagIC Net (new control and data acquisition software).

The features of intelligent ion chromatography are the intelligent and innovative components (iPump, iColumn, iDetector, 800 Dosino, and MagIC Net) and detectors (conductivity detector, 887 Professional UV/VIS Detector, 896 Professional Detector – Amperometry) that are incorporated in the 850 Professional IC. They enable comprehensive, automatic monitoring and optimization of all system parameters and complete documentation in accordance with GLP and FDA regulations. The IC system is able to make logical decisions independently (e.g., during sample preparation) and offers very easy operation even of complex procedures. This leads to a maximum level of reliability and analytical results. The very same intelligence is also included in the compact intelligent ICs: the 881 Compact IC pro and the 882 Compact IC plus.

Why is Ion Chromatography Successful?

The success of Metrohm IC is based on the interplay of several factors like their ease of use as well as multilanguage user interfaces and operating instructions. A great deal of manual work is eliminated by using "Metrohm Inline Sample Preparation" (MISP), and with the help of numerous automation solutions. The combination of sample preconcentration/dilution and matrix elimination (Metrohm intelligent Preconcentration Technique with Matrix Elimination, MiPCT-ME) enables automatic ion chromatographic analyses to be performed over six orders of magnitude. Moreover, if a sample is outside the calibration range, because, for example, its concentration is too high, then it is diluted and reanalyzed.

Numerous coupled techniques such as IC-MS and IC-ICP-MS also make it possible to analyze samples that are difficult to separate. Metrohm's long experience in ion analysis enables ion chromatography, titration, voltammetry, and direct measurements to be fused together in compact, tailor-made units: the TitrIC pro and VoltIC pro systems for water analysis are the best example of this.

Fig. 2: The intelligent 850 Professional IC is flexible and offers all the conceivable possibilities of modern IC

Quality is Guaranteed

Metrohm stands for high-quality, robust instruments, and software that is "Made in Switzerland" and state of the art. Users of the products achieve extremely low detection limits and obtain highly accurate analytical results with guaranteed data security. All Instruments have a three-year warranty. The numerous suppressor modules even carry a ten-year warranty. A worldwide network of distributors and subsidiaries provides application support and offers seminars and training. Application literature (monographs, application bulletins, application notes, technical posters, and technical articles) is available free of charge and can for the most part be downloaded directly from www.metrohm.com.

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