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Ion Chromatography and Related Techniques 2016

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Every day in hundreds of thousands of laboratories around the world, a millions analyses of different resources are implemented. Obviously, the biggest group of these samples is water and waste water samples. The development of new approaches and development of current ones are important duties for analytical chemists. Advances in analytical instrumentation, detection methods and separation tactics have, in lots of instances, provided analytical chemists the tools required to continually lower method detection limits.

The Idealized Method for Water Analysis Should Meet the Following Requirements

Resolution of target analytes with limit of determination on 25% of maximum acceptable concentration; no sample pretreatment; brief time spent on evaluation; low fee of single evaluation and method availability. The resolution of common inorganic anions and cations was traditionally carried out utilising wet chemical methods such as gravimetry, titration, photometry, turbidimetry, and colorimetry. Many of these methods suffer from interferences and restrained sensitivity and they are able to be labor intensive and difficult to automate. An substitute, presented in 1975, that has virtually changed most of the wet chemical methods used for anions and cations determination is ion chromatography. Its presents a couple of advantages over conventional methods for determination of ions, reminiscent of: short time of evaluation; sensitivity at the μg/L level; excessive selectivity in samples with elaborate matrices; small sample quantity; simultaneous determination of anions and cations, or inorganic and organic ions; species analysis; and use of low-cost, risk-free, and environment friendly chemical substances.

Ion chromatography offers an enormous range of possibilities for the selection of stationary and mobile phases and, in combination with different detection techniques, usually is able to solve even difficult separation problems. Therefore, despite of routine analysis of anions and cations in water and wastewater ion chromatography is also used for more complex samples such as clinical and industrial samples.

Ion chromatography approaches meet these requisites and can be utilized for pursuit"s purposes in environmental laboratories. Considering that several individual persons wet chemistry methods for common common inorganic anions or cations would be replaced by way of one quick and nontoxic chromatographic separation, it is not stunning that ion chromatography has rapidly emerge as accredited international through regulatory bodies to be used for the analysis of anions and cations in water and waste water. Ion chromatography can also be considered to be a well-established, mature method for the analysis of anions and cations and many corporations, equivalent to ISO, US EPA, ASTM (American Society for checking out and materials), and AOAC (association of Official Analytical Chemists) base their standards or regulatory methods of analysis upon it. It is worth to mention that chromatography as a separation method began in 1903, when Mikhail Seymonovich Tsvet, a Russian biochemist working at the Department of Chemistry of the Warsaw University (Poland), who separated plant dyes using adsorption in the column filled with calcium carbonate and other substances. After performing the extraction with the petroleum ether, he obtained clearly separated colourful zones. To name this method, he used Greek words meaning "colour" and "writing" to coin a new word–"chromatography", which literally meant "writing colours". At present, chromatographic methods are among the most popular instrumental methods in the analytical chemistry as they offer quick separation and determination of substances, including complex matrix samples.

Since 2005 international conferences on the theory and applications of the ion chromatography are organized by Prof. Rajmund Michalski from the Institute of Environmental Engineering of Polish Academy of Sciences in Zabrze (Poland) (Figures 1-4). XI International Conference took place this year in April 20-21, with the participation of 158 participants from all over the world. Detailed information about program, posters and lecturers (and some photos) is available on: http://ipis.zabrze.pl/index.php/pl/nauka/pm-konferencje/45-zorganizowane-ipi-pan/744-xi

Plenary lectures were given by eminent professors: Bogusław Buszewski from Nicolas Copernicus University in Toruń, Poland - A new generation of packing material for solid phase extraction; Jay Gandhi from ASTM, USA - Monitoring micronutrients in various water using ion chromatography; Rosa M. Alonso from University of Bask Country, Bilbao Spain) - Contributions of separation techniques to quality control in the fluorinated derivatives industry; Maria-Virginia Coman from Babeş-Bolyai University in Cluj-Napoca, Romania - Related techniques used for the analysis of some antibiotics in water and sediment samples ; Maria Concetta Bruzzoniti from University of Torino, Italy - Ion chromatography: Recent advances

Figure 1: International conferences on the theory and applications of the ion chromatography (organized by Prof. Rajmund Michalski).

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Figure 2: International conferences on the theory and applications of the ion chromatography (organized by Prof. Rajmund Michalski).

Figure 3: International conferences on the theory and applications of the ion chromatography (organized by Prof. Rajmund Michalski).

Figure 4: International conferences on the theory and applications of the ion chromatography (organized by Prof. Rajmund Michalski).

and environmental applications; Joachim Weiss from Leopold-Franzens University in Innsbruck, Austria - Mixed-mode liquid chromatography - Combining the best of both ionexchange and reversed-phase chromatography; Jürgen Mattusch z Helmholtz Centre for Environmental Research in Lipsk, Germany - Speciation analysis by ICPMSMS/ESIQTOFMS - Principles and applications); Andreas Seubert from Philipps-Universität in Marburg, Germany - Separation of inorganic anions on sulfobetaine exchangers of different charge distance with suppressed conductivity detection); Wolfgang Frenzel from Technical University in Berlin, Germany - Application of ion chromatography in environmental research and analytical routines – Do we have what we need?; Krisztián Horvath from University of Pannonia in Veszprem, Hungary - Determination of equilibrium isotherms in ion chromatography by the inverse method) and Humberto Gomez Ruiz from National Autonomous University of Mexico in Mexico - Evaluation of ion chromatography as an alternative method for complying with water quality regulations in Mexico. In total, during the two-day conference were delivered 15 lectures, 13 messages, and during the two days of the session poster presented 40 posters. As every year for conferences issued a monograph "Ion Chromatography and Related Techniques 2016" contains works related to the theme of the conference. It was a good opportunity to discuss new developments in the field of ion chromatography and related techniques, share experiences and present the results of their own. At present, the greatest challenges in ion chromatography are related to introducing new ion-exchange stationary phases; improving the suppressor operation efficiency; lowering the limits of detection and quantification for analytic ions; elaborating new sample preparation methods; extending the analysis range with new organic and inorganic substances; increasing the use of different ion chromatography types in the molecular biology and genetics research (genomics, proteomics, metabolomics, transcriptomics); elaborating new standard and detection methods; and apparatus miniaturization. Even though ion Chromatography is in its early forties, it is still a developing and prospective instrumental analytical method that has many applications extending far beyond the determination of inorganic ions.