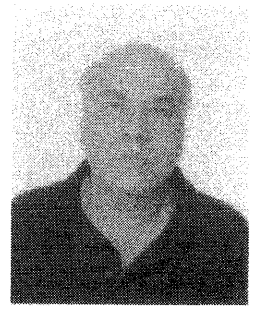
Conference report

12th International Conference on Flow Injection Analysis Including Related Techniques



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The 12th International Conference on Flow Injection Analysis Including Related Techniques took place in Mérida, Venezuela, in the majestic scenery of the Venezuelan Andes. The Joint Conference Chairs, José Luis Burguera (Los Andes University, Venezuela) and Koos van Staden (University of Pretoria, South Africa), and the organizing committee hosted more than 70 participants from all over the world that contributed to the success of this conference. The Conference was held in cooperation with the Japanese Association for Flow Injection Analysis (JAFIA) who celebrated their 20th Anniversary.

ICFIA 2003 was hosted by Los Andes University in Eastern Venezuela. The Conference was proclaimed in honor of Professor Gary Christian (University of Washington, USA) and Mrs. Sue Christian for their contribution and devotion to ICFIA through all the years.

Approximately 14 plenary lectures, 30 oral presentations and 70 posters clearly illustrated the importance of flow injection –based techniques in analytical, environmental and clinical analysis.

It is self-evident that a four page conference report is far too short to even briefly summarize the science presented and, therefore, only selected highlights will be covered.

Plenary Lectures

From the opening lecture well presented by Elo Harald Hansen (Technical University of Denmark) and the lecture presented by Gary Christian it became clear that there is an increasingly better understanding of sequential injection analysis (SIA) and the most recent Lab-on-Valve (LOV), where "a microlaboratory" can be integrated in a selection valve. The presentations of Kate Grudpan (Chiang Mai university, Thailand) proposed a "Lav-at-Valve" LAV) system using sequential injection with a sample processing device attached to a conventional multiposition selection valve.

The potential of the lab-on-disc (use of the compact disc analyzer) concept in microfabricated microfluidic systems is an important issue presented by Koos van Staden. The development of new devices, such as: flow biodetection amperometric analysis, thermo-controlled flow cells, and double and serial flow cells were respectively described by Miltiades Karayannis (University of Ioannina, Greece), Tadao Sakai (Aichi Institute of Technology, Japan).

Also less "traditional" combinations of multi-pumping, multisyringe flow systems received attention. José L.F.C. Lima (University of Porto, Portugal) described the utilization of multiple solenoid-actuated micro pumps which, being the only active elements of the flow manifold, could be triggered individually or in combination producing a pulsed flow that enables sample insertion, reagents commutation and solutions transportation. Victor Cerdá (University of the Balearic Island, Spain) described the advantages of the use of commutation solenoid valves in multicommuted and multisyringe flow injection analysis. Maximo Gallignani (Los Andes University, Venezuela) described the possibilities offered by flow analysis-hydride generation-FTIR for the individual and simultaneous determination of some elements (e.g., arsenic and tin) in complex real samples.

The use of multicomponent analysis using electrochemical and fluorimetric sensor were described by Raluca-Ioana Stefan (presented by Koos van Staden) and Shoji Motomizu (Okayama University, Japan), respectively.

The prior assay approach aiming to assist the course of the analysis through concentration-oriented decisions for flow systems was presented by Elias A.G. Zagatto (CENA, Sao Paulo University, Brasil) to permits, among others, a faster information processing.

The use of organized assemblies (emulsions, microemulsions, micelles and vesicles) to analyze highly viscous samples in on-line systems was described by Marcela Burguera (Los Andes University, Venezuela); special emphasis was made regarding to the advantages offered by the systematic approach to optimize the formation of these organized aggregates.

The mathematical modeling of flow injection (FIA and SIA) systems were presented by Ari Ivaska (Abo Akademi University, Finland); the flow systems were described using a system of partial differential equations: Navier-Stokes equation for incompressible fluids flow and diffusion-convection equations with or without chemical reactions.

Multicomponent devices

J.A.V. Prior (University of Porto, Portugal) described the use of a multi-component device to assess the accuracy for the determination of antithyroids by using a dedicated software to control all the operations involved in consecutive chemical determinations.

Other groups from Porto in Portugal (M.I.G.S. Almeida, J.L.F.C. Lima, A.O.S.S. Rangel and Co-workers from the University Católica Portuguesa and University do Porto) and from Palma de Mallorca in Spain (V. Cerdá, E. Gómez, R. Forteza and Co-workers, University of

Balearic Islands) described further instrumental developments of multisyringe semiautomatic methods to determine various species of environmental interest. Also, the last research group introduced an intelligent multicommuted flow injection analyzer for the preconcentration, speciation and monitoring of Fe(II) and Fe(III) in environmental and pharmaceutical samples.
A multicommuted flow system for the determination of wear metals in lubricating oils by flame AAS was described by M. Knochen (Universidad de la República, Uruguay); the system achieved direct dilution of the oil sample with solvent and introduced the diluted sample in the spectrometer.

Sequential Injection Analysis (SIA)

From the various lectures and posters it is clear that there is definitely a lot of development taking place in the field of SIA. The use of spectrophotometric (Koos van Staden and K. K. Grudpan), chemiluminescence (T. Imato, Kyushu University, Japan), diode array (Koos van Staden), voltametric (J. Jakmunee, Chiang Mai University), europium sensitized fluorescence (S.M.Z. Al-Kindy (Sultan Qaboos University, Sultanate of Oman) and potentiometric (J. Jakmunee, Chiang Mai University) detectors coupled to SIA systems were widely described.
The use of biosensors is of use whenever highly specific and reliable results are required (Koos van Staden; D. Nacapricha, Mahidol University, Bangkok, Thailand).

Electrochemistry

The amperometric (W. Sianproh and O. Chailapakul, Chulalongkorn University, Bangkok, Thailand) and voltametric (T. Nagaoka, Osaka Prefecture University, Japan) detectors have attracted much attention from several new aspects of the use of diamond electrodes for direct electrochemical monitoring of different compounds. The on-line electrochemical regeneration using immobilized metelloenzymes onto porous glass beads determination (I. Satoh, Kanagawa Institute of Technology, Japan) evolved into a method for the determination of zinc ions at nanomolar levels.

Biosensors

New fields of applications are opened as a result of the use of biosensors based on carbon paste (K. Vytras, Pardubice University, Czech Republic; R.I. Stefan, University of Pretoria, South Africa), acetylcholine (K. Matsumoto, Kyushu University, Japan) and L-amino acid oxidase peroxidase or/and horseradish peroxidase (R.I. Stefan).
M. Karayannis (Ioannina University, Greece) described an amperometric biosensor by forming a polymer based matrix membrane sandwiched between two polycarbonate membranes to determine L-fucose in urine.

Gaseous species

The potential of new fields of application of the hydride and cold vapour mercury generation approach was described by various authors. Bismuth and boron (P. Carrero, Los Andes University) were respectively determined in urine and soil samples.
B. Karlberg (Stockholm University, Sweden) described the potential of Fabry Pérot Quantum Cascade lasers for transmission measurements of aqueous samples using FI; also, he described the use of infrared detection in micro-flow systems.
M. Gallignani (Los Andes University) described the determination of nitrite in waters and of free Sb(V) and total antimony in pharmaceuticals using different FI – gas phase generation – fourier transform infrared (FTIR) spectrometric determinations.
N. Carrión (Central University, Venezuela) preferred the on-line determination of selenium in oyster tissue by hydride generation – Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES).
A less "traditional" combination of FI-ICP-OES received the attention by L. dlC. Coo (University of the Philippines), who used fiber optics for remote fluorescence spectroscopy monitoring.
Koos van Staden described a SIA method based on the absorbance of a condensation product to determine phenylephrine hydrochloride in pharmaceutical preparations.
D. Nacapricha described a gas-diffusion unit fitted inside a FI system with a PTFE membrane for determination of iodide in pharmaceuticals products by chemiluminescence.

Solid phase extraction

The separation and pre-concentration of trace metals was described by Y. Petit de Peña and Co-workers (Los Andes University). Continuous flow systems were used for lead determination in alcoholic drinks and natural waters using zeolites. Whereas, M. Knochen and Co-workers (Universidad de la República, Uruguay) determined phenylephrine hydrochloride in pharmaceuticals using a Dowex 50W X8 ion-exchange resin.

HPLC analysis

The development of different on-line HPLC methods were described for the identification and quantification of a variety of carboxylic fatty acids in formulations of water/microemulsion/oil systems with UV detection (B. Bravo and Co-Workers, University of Zulia, Venezuela), vitamin D_3 in blood serum with sample cleanup (M.R. Brunetto and Co-workers, Los Andes University) with UV detection, alcohol polethoxylated in surfactants using microwave assisted derivatization with photodiode array (G. Chávez and Co-workers, University of Zulia), peroxide in healthcare products with UV detection (M. Bloomfield, GlaxoSmithKline Consumer Healthcare, Surrey, U.K.).

Other novel applications

While new field of applications are opened to as a result of the description of other FI systems. E.g., H. Tanaka (Tokushima University, Japan) described the determination of acid/base dissociation constants by

feeback-based flow/ratiometry, K. Oguma and C. Tanaka (Chiba University, Japan) described the determination of bromate and iodate using their oxidative reaction with iron(II)-phen complex, H. Ukeda and Co-workers (Kochi University, Japan) monitored the antioxidant capacity of pure compounds and food based on scavenging of a radical cationic specie through a peroxidase-immobilized reactor, and M. Zenki and Co-workers (Okayame University of Science, Japan) determined ascorbic acid in large quantities of co-existing oxidant in a cyclic system.

The use of kinetic determinations in FI is also of increasing interest. S. Nakano (Tottori University, Japan), J-i. Itoh and J. Liu (Kitami Institute of Technology, Japan), (D. Nacapricha) and J. Jakmunee (Chiang Mai University) respectively described the simultaneous determination of Se(IV) and Se(VI), some sulfyhydryl thiols, iodate and iodide, and some inorganic species in various matrixes based on different catalytic effects. Also, D. Nachapricha described the application of sound card for simple telemetry for radio communication in a FI system.

Different extraction-flow injection systems have been described for the determination of paraquat and diquat (K. Higuchi, Aichi Institute of Technology, Japan) and lead in gasoline (M. Gallignani, University of Los Andes, Venezuela)..

A number of organic ligands have been used by L. DlC. Coo (University of the Philippines), and H. Itabashi (Gunma University, Japan) for the respective determination of selenium using chemical sensors and Cu(II) by a stopped-flow method.

S.R.P. Meneses (CENA, Sao Paulo University) determined sulphate in soil extracts based on the reaction of the sulphate ion with barium-dimethylsulfonazo(III) complex. K. Higuchi (Okayama University, Japan) installed an on-line reactor column, which can accelerate the exchange reaction between sulphate ion and a barium chelate, and can complete the precipitation of barium sulphate, for the determination of sulphate in water samples. Also, Y. Iida (Kanagawa Institute of Technology, Japan) used an acid urease column but to determine urea in rice wines by fluorimetry.

S. Motomizu (Okayama University, Japan) described a FI system coupled with a three-hole chromatomembrane cell for the determination of air pollutants, such as nitrogen dioxide and sulphur dioxide.

G. Pignalosa (Universidad de la República, Montevideo, Uruguay) determined insoluble matter in diesel lubricating oil by FI-visible spectrometry and involves a cascade dilution step with deodorized kerosene.

Next meeting

The Steering Committee has selected the next venue for the ICFIA to be University of Washington in Seattle, USA. Gary and Sue Christian will organize and host the conference. Information will be given in the near future (christian@chem.washington.edu).