HPLC column. A Zorbax Eclipse XDB C_8 column (Agilent Corp., USA), 15 cm x 4.6 mm i. d., containing 5 µm diameter packing material was used.

Samples were injected onto this column via an injection valve filled with 20 µl loop. The mobile phase system was the mixture of methanol/water containing various amounts of sodium chloride, sodium acetate or ammonium acetate at flow rate 1.0 ml min^{-1}. All chromatographic elutions were isocratic and carried out at room temperature.

A HP 1100 series mass-selective detector single quadrupole instrument equipped with the orthogonal spray-ESI (Agilent, USA) interface was used for these investigations. The fragmentor voltage, nebulizer pressure, drying gas flow rate, drying gas temperature and capillary voltage were set to 150 volts, 20 psi, 10 l min^{-1}, 350 °C and 3,500 volts, respectively.

2.3 Sample preparation

Prior to HPLC analysis, water samples were subjected to purification and preconcentration on the Sep-Pak C_{18} cartridge (Waters, USA). The cartridge was preconditioned with 7 ml methanol, followed by 7 ml of deionised water and then the sample was passed through the cartridge. The cartridge was washed with 6 ml of the mixture of MeOH-H_2O (30:70, v/v) and was eluted with 3 ml of methanol.

3. Results and discussion

The optimization of LAS separation using reversed-phase high performance liquid chromatography (RP-HPLC) with UV detection at 224 nm was achieved, employing Eclipse XDB C_8 column with 15 cm x 4.6 mm dimension and 5 µm film thickness. Optimum separation of LAS homologues containing 10-13 carbon atoms was obtained by appropriately adjusting the composition of mobile phase, type and the concentration of salt. The emphasis was placed on the use of common salts (sodium chloride, sodium acetate and ammonium acetate), instead of using sodium perchlorate, in order to avoid capillary blockage and high background signal when using mass spectrometric detection.

3.1 Effect of mobile phase composition

Mobile phase compositions in the range of 70-80% (v/v) methanol in water were investigated. Separation of a mixture of C_{10} LAS, C_{11} LAS, C_{12} LAS and C_{13} LAS was carried out as depicted in Fig. 2. LAS compounds were separated using 70% methanol in water as mobile phase. However, most peaks obtained were broad, particularly C_{13} LAS. It was also observed that the LAS compounds containing 10 and 11 carbon atoms were not resolved completely when using 75% methanol. No separation was observed when using the amounts of methanol exceeding 80%. It is evident from these chromatograms that the composition of mobile phase affects peak resolution and peak shape significantly. It was noticed that peak resolution deteriorated with increasing methanol content. This could be explained that surfactants are hydrophobic in nature. The hydrophobic characteristic of long chain surfactants is suppressed by increasing methanol resulting in reducing retention time [27].

3.2 Effect of type and concentration of salt

Preliminary experiments were undertaken in an attempt to find suitable salt adding into mobile phase for improving LAS separation. Sodium chloride was common salt used for separations of LAS mixture as shown in Fig. 3. Four LAS compounds were successfully resolved within 6 min when using the 80/20 (v/v) mixture of methanol and water containing 3.5 mM NaCl. When using the 75/25 (v/v) mixture of methanol and water containing 3.5 mM NaCl the same four LAS compounds were separated in over 12 min. It was also observed that C_{10} LAS and C_{11} LAS were partially resolved when using the amounts of methanol exceeding 85%. The mixture of methanol/water (80/20, v/v) was therefore selected for further method development and applications.

As demonstrated earlier, the selection of a suitable common salt is a critical factor in obtaining optimum resolution and short separation times. Three types of common salts, i. e., sodium chloride, sodium acetate and ammonium acetate were investigated at the concentrations ranging from 1 to 10 mM adding into the mixture of methanol/water (80/20, v/v) a long with a mobile phase flow rate 1.0 ml.min^{-1}. It was observed that the resolution and their retention time increased with the concentration of salt (Figs. 4-6). The minimum concentrations of sodium chloride, sodium acetate and ammonium acetate that could be used to separate the four LAS compounds (resolution ≥ 1.5) in approximately 5 min under isocratic condition were 1, 2 and 1.5 mM, respectively. In comparing the data obtained in this study to the data reported elsewhere [28] indicated that the developed method provided a significantly improved resolution, peak shape, particularly C_{12} LAS, short analysis time and simple approach for confirmation results by mass spectrometric detector.

3.3 Linearity, accuracy and detection limit

All experiments were carried out under the optimum mobile phase containing 80% methanol and 1.5 mM ammonium acetate in water. Linearity, accuracy and detection limit for individual LAS compounds are summarized in Table 1. The accuracy expressed in terms of percentage recovery was done by spiking various amounts of LAS standard (1 ng μl^{-1}) into the water samples collected from wastewater in Chiang Mai and Utraradit, Thailand. The percentage recoveries of this method for C_{10} LAS, C_{11} LAS, C_{12} LAS and C_{13} LAS were found to be between 91-101 (n = 3), 92-99 (n = 3), 95-99 (n = 3) and 94-102 (n = 3), respectively. Satisfactory recovery was obtained. The C_{10} LAS had the lowest detection limit of 1.43 pg μl^{-1}. The C_{13} LAS, which is the last compound to elute under the conditions employed, had the highest detection limit value of 11.35 pg μl^{-1}. From the observation, the peak shape of C_{13} LAS is rather broader than that of C_{10} LAS.

3.4 Analysis of LAS surfactant in real water samples using HPLC-UV

In order to demonstrate that the method developed in this study is suitable for LAS separation in "real" samples, several natural water and wastewater extracts were analysed. As depicted in Fig. 6(b), an increase of methanol from 75 to 80% is expected to cause C_{10} LAS and C_{11} LAS to elute close to some interferences present in sample extracts (Fig. 7). The mobile phase containing 1.5 mM ammonium acetate in methanol/water mixture of 78 to 22 (v/v), instead of the ratio of 80 to 20 (v/v) methanol/water, was used in order to avoid matrix effects arising from the water extracts. These effects cause a 2 minute increase in the separation time of LAS compounds. Under the proposed condition, the LAS compound concentrations in various water samples determined using a Zorbax Eclipse XDB C_8 column in combination with the methanol/water mixture containing ammonium acetate, were reported in Table 2.

3.5 Identification of LAS surfactants in water extract using LC-ES-MS

It is well known that the identification of LAS compounds using chromatographic techniques is based solely on retention time matching. As a consequence, errors can result from using this approach, especially in the case of co-eluting compounds. Also of particular interest is the numerous unknown anionic surfactants that have been found in environmental samples when analysing them using HPLC-UV [17-19].

To overcome such problems, the negative-ion electrospray (ES) – mass spectrometry was used for confirmation of LAS compounds in water samples. The mass spectra of water extracts (Fig. 8) show the *m/z* 183 ion common to LAS compounds. In addition, the high intensity of the molecular ions observed at *m/z* 297, 311, 325 and 339 originating from the water extracts are similar to those originating from the LAS standards (Fig. 9). These ions correspond to C_{10} LAS, C_{11} LAS, C_{12} LAS and C_{13} LAS, respectively.

4. Conclusion

The proposed method offers superior performance characteristics, i.e. a simple method, significant improvement in resolution ($R > 1.5$, indicating a complete separation), short analysis time (7 min) and using less amount of common salt (1.5 mM ammonium acetate) under isocratic condition. With this regard, it is easy to use this method with a mass spectrometric detector without any blockage of MS capillary. In addition, the use of low amounts of salt also increases the column's life and only requires very short re-equilibration time between each injection. Overall, these features demonstrate that the method is suitable to be used for routine analysis for both the identification and quantification of individuals of C_{10} – C_{13} LAS surfactants in various water samples.

Acknowledgements

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Table 1 Analytical merits of the proposed method (linearity, accuracy and detection limit)

Compound	Concentration range (pg μl^{-1})	R^2	Linearity cut-off (pg μl^{-1})x10^3	%Recovery	Detection limit* (pg μl^{-1})
C_{10} LAS	6-310	0.9984	41	91-101	1.43
C_{11} LAS	20-1030	0.9997	137	92-99	7.92
C_{12} LAS	20-1070	0.9994	143	95-99	7.07
C_{13} LAS	10-590	0.9979	78	94-102	11.35

*Calculation based on three times the background standard deviation.

Table 2 Concentration of LAS compounds in water samples (mean ± *s*; n = 3)

Type of water	Concentration (pg μl^{-1})			
	C_{10} LAS	C_{11} LAS	C_{12} LAS	C_{13} LAS
W1	115.3 ± 2.7	303.2 ± 7.9	184.4 ± 8.0	81.9 ± 2.2
W2	310.0 ± 0.3	1173.4 ± 4.6	1145.0 ± 12.9	424.4 ± 5.0
W3	5.0 ± 0.1*	23.4 ± 0.5	26.5 ± 1.1	21.1 ± 1.5
W4	n.d.	n.d.	13.0 ± 0.9	14.8 ± 0.5
W5	n.d.	n.d.	n.d.	n.d.
W6	3.4 ± 0.1*	12.8 ± 0.9	15.1 ± 1.3	16.7 ± 1.6
W7	54.1 ± 1.9	120.1 ± 5.5	69.1 ± 4.8	36.6 ± 5.2
W8	n.d.	n.d.	n.d.	n.d.
W9	n.d.	n.d.	n.d.	n.d.
W10	8.8 ± 0.3*	30.9 ± 0.7	33.5 ± 1.7	25.2 ± 1.7
W11	14.5 ± 0.8*	48.0 ± 2.4	46.9 ± 3.5	28.9 ± 2.8
W12	6.5 ± 0.4*	27.8 ± 1.9	30.3 ± 2.1	22.6 ± 1.3

n.d.: not detected. (less than the detection limit value)

* preconcentration as described in Section 2.3.

W1: Drainage water from student dormitory, Chiang Mai University.
W2: Wastewater from Center of Medical Sciences, Ministry of Public Health.
W3: Wastewater from Khuy Hospital, Utaradit Province.
W4: Domestic wastewater released into Thorn canal, Utaradit Province
W5: Natural water in Mae-Ping River, Chiang Mai Province.
W7: Wastewater in Mae-Kha canal, Chiang Mai Province.
W8: Natural water in Ang-Kaew reservoir, Chiang Mai University.
W9: Water in Chiang Mai Moat, Chiang Mai Province.
W6 and W10 – W13: Natural water from irrigation canal, Chiang Mai Province.

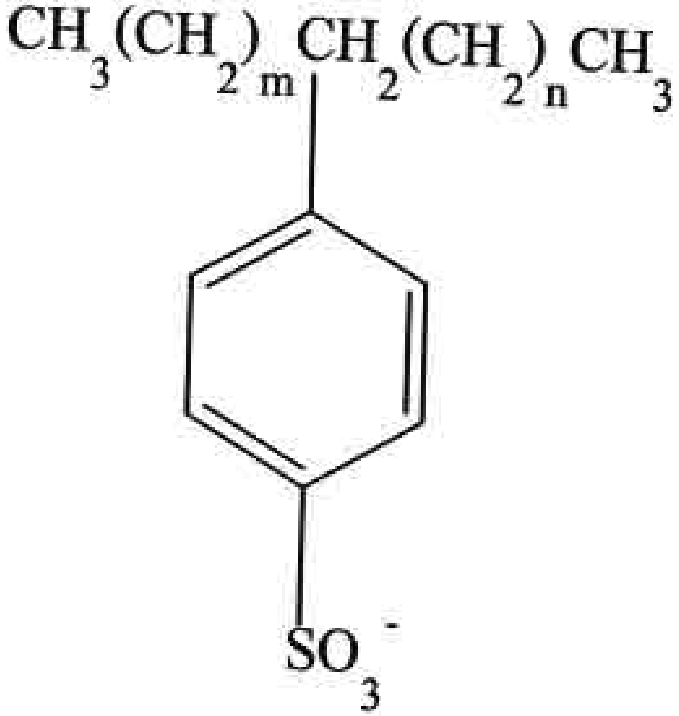

Fig. 1 General chemical structure of LAS

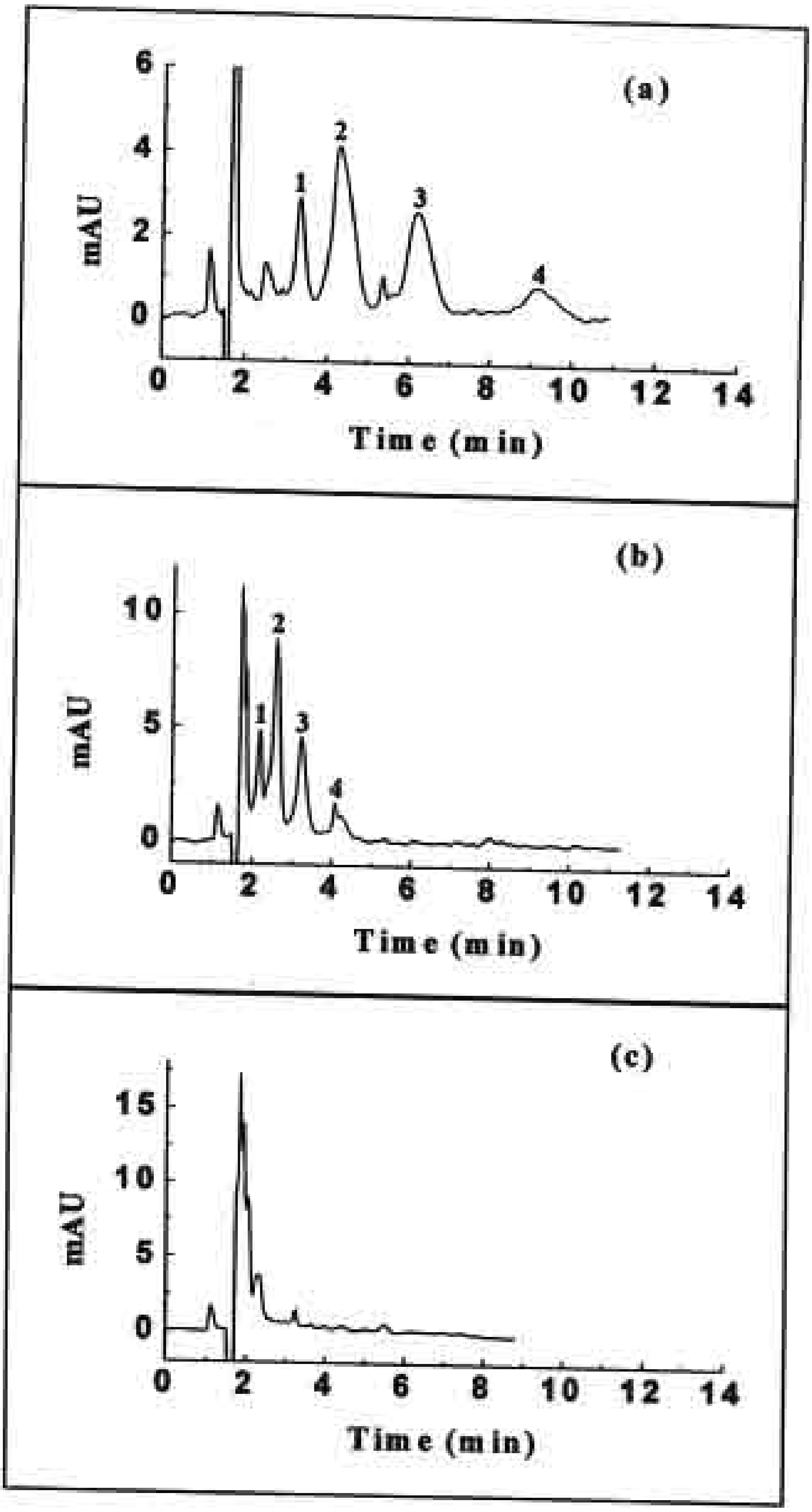

Fig. 2 Chromatograms of mixture of four LAS compounds obtained using various mobile phase compositions of MeOH-H_2O: (a) 70-30, (b) 75-25 and (c) 80-20. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

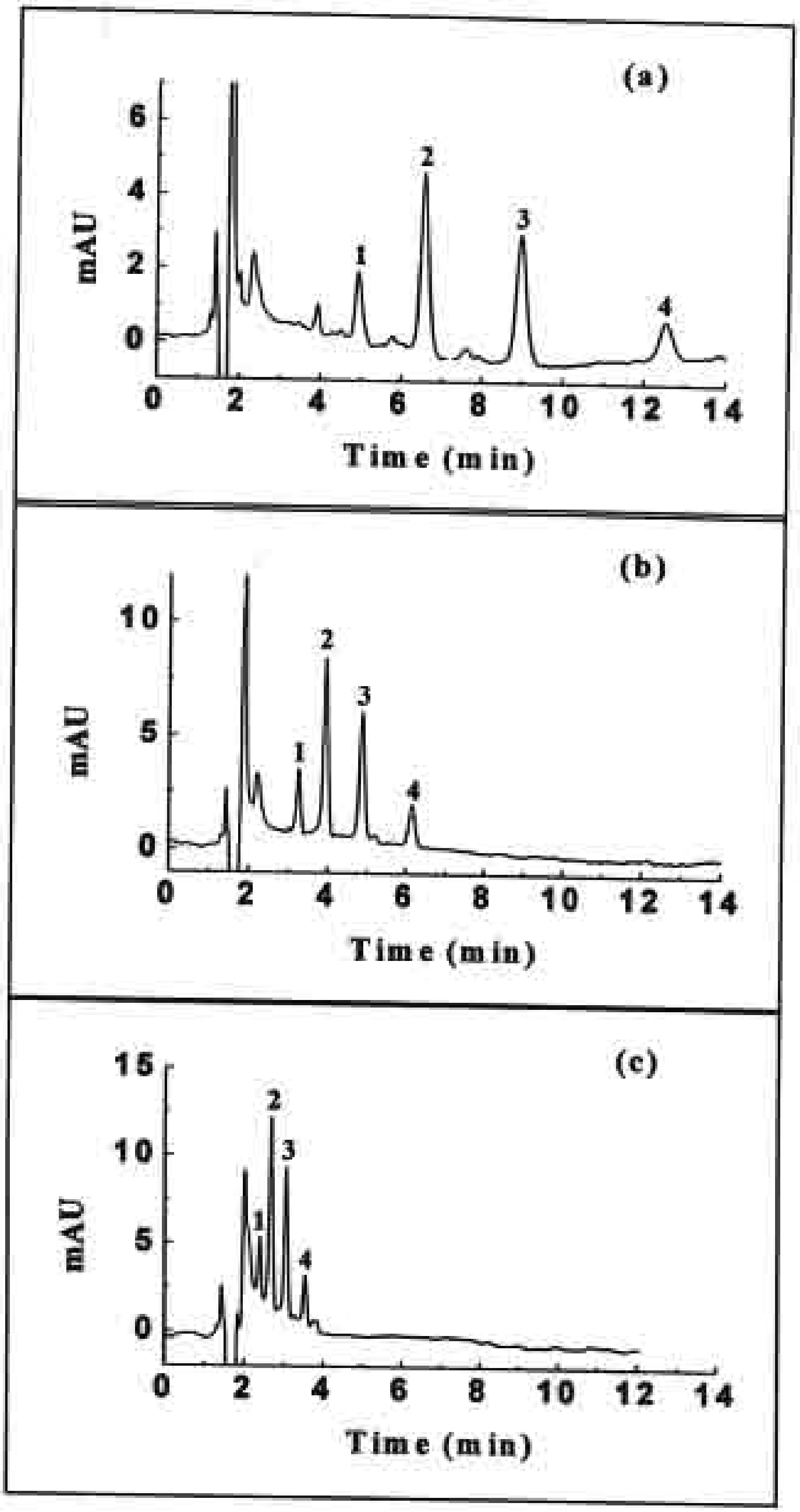

Fig. 3 Chromatograms of mixture of four LAS compounds obtained using various mobile phase compositions in the presence of 3.5 mM NaCl and MeOH-H_2O: (a) 75-25, (b) 80-20 and (c) 85-15. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

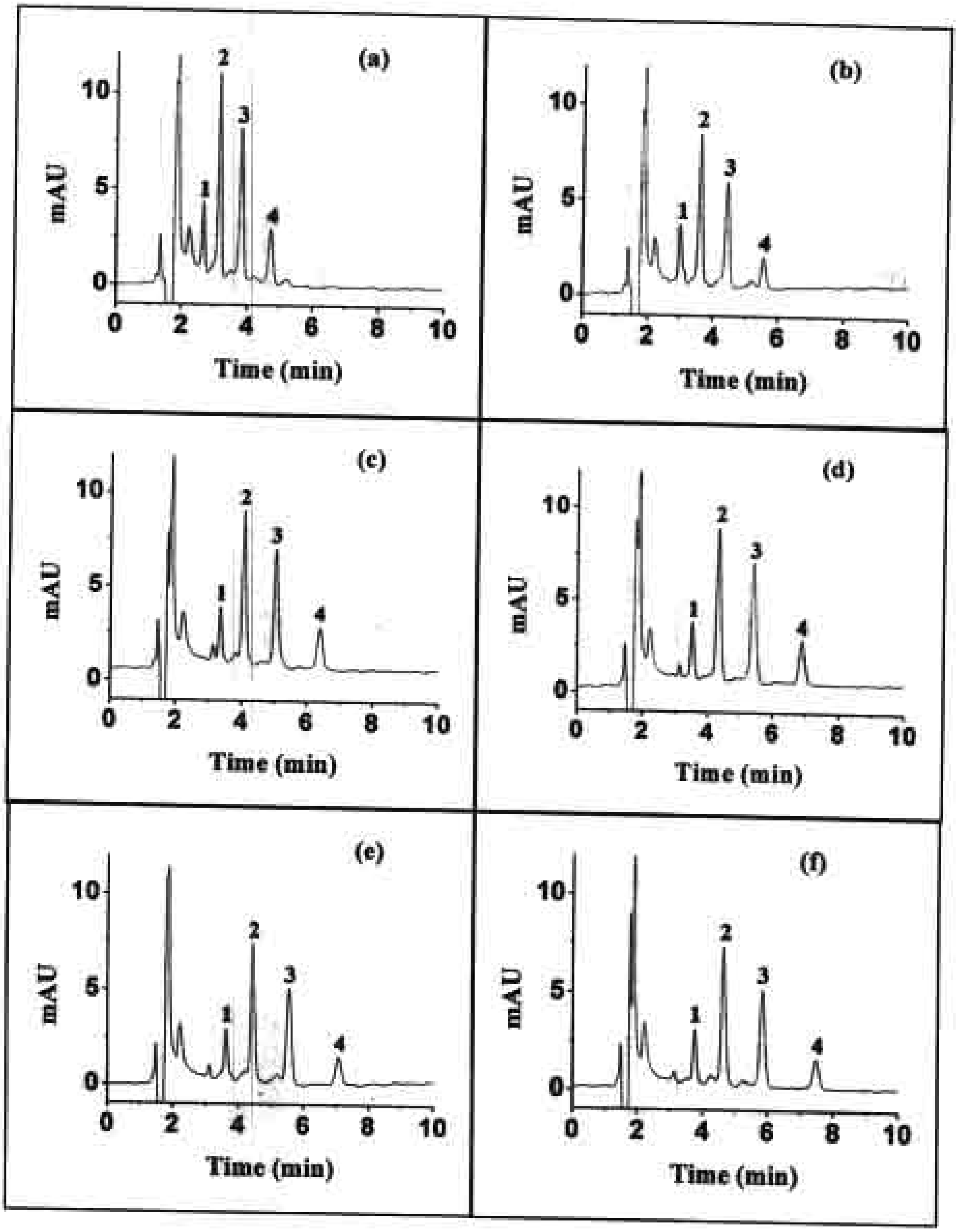

Fig. 4 Chromatograms of mixture of four LAS compounds obtained using 80% (v/v) methanol in water containing various concentrations of sodium chloride: (a) 1, (b) 2, (c) 4, (d) 6, (e) 8 and (f) 10 mM. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

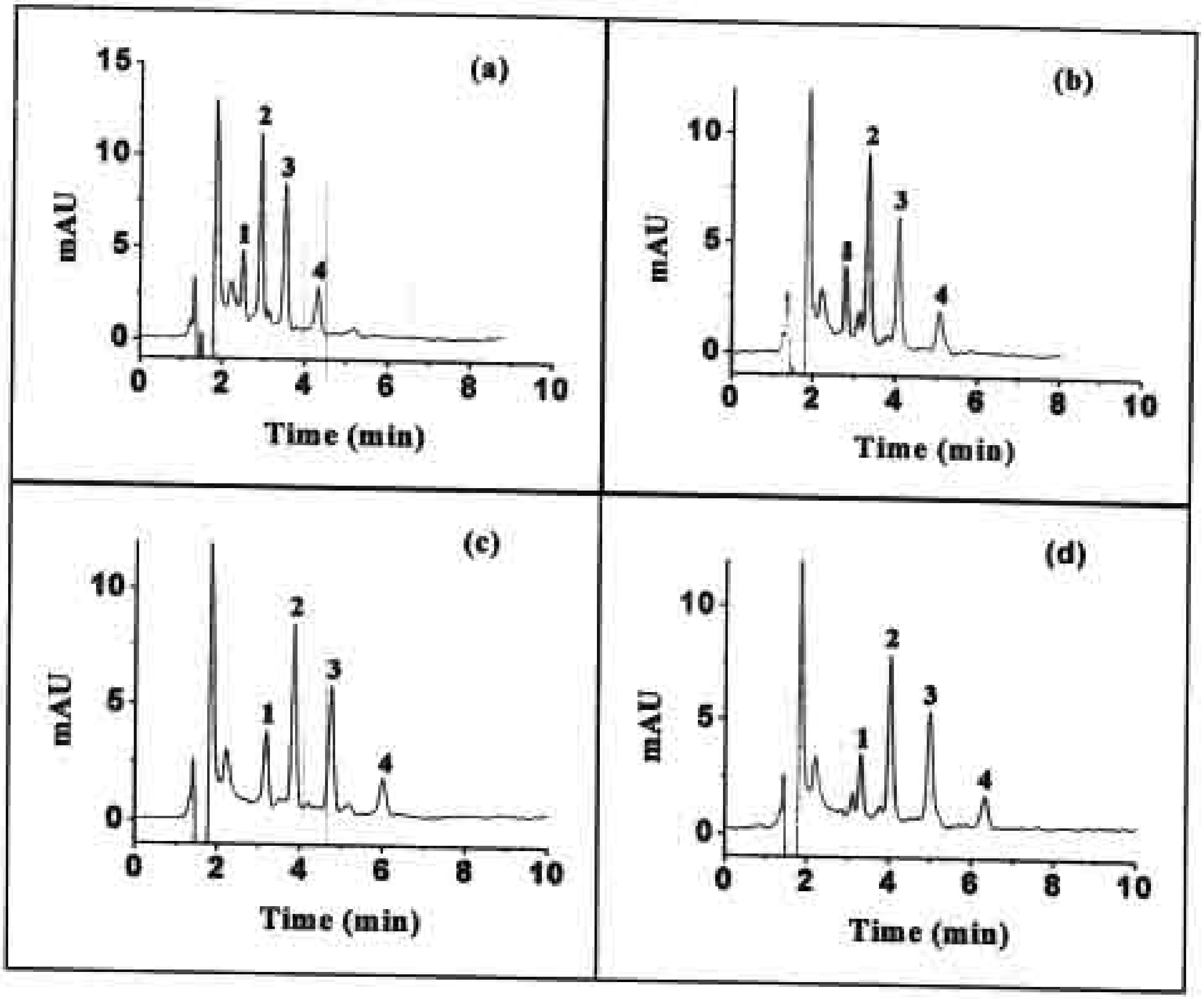

Fig. 5 Chromatograms of mixture of four LAS compounds obtained using 80% (v/v) methanol in water containing various concentrations of sodium acetate: (a) 2, (b) 4, (c) 8, and (d) 10 mM. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

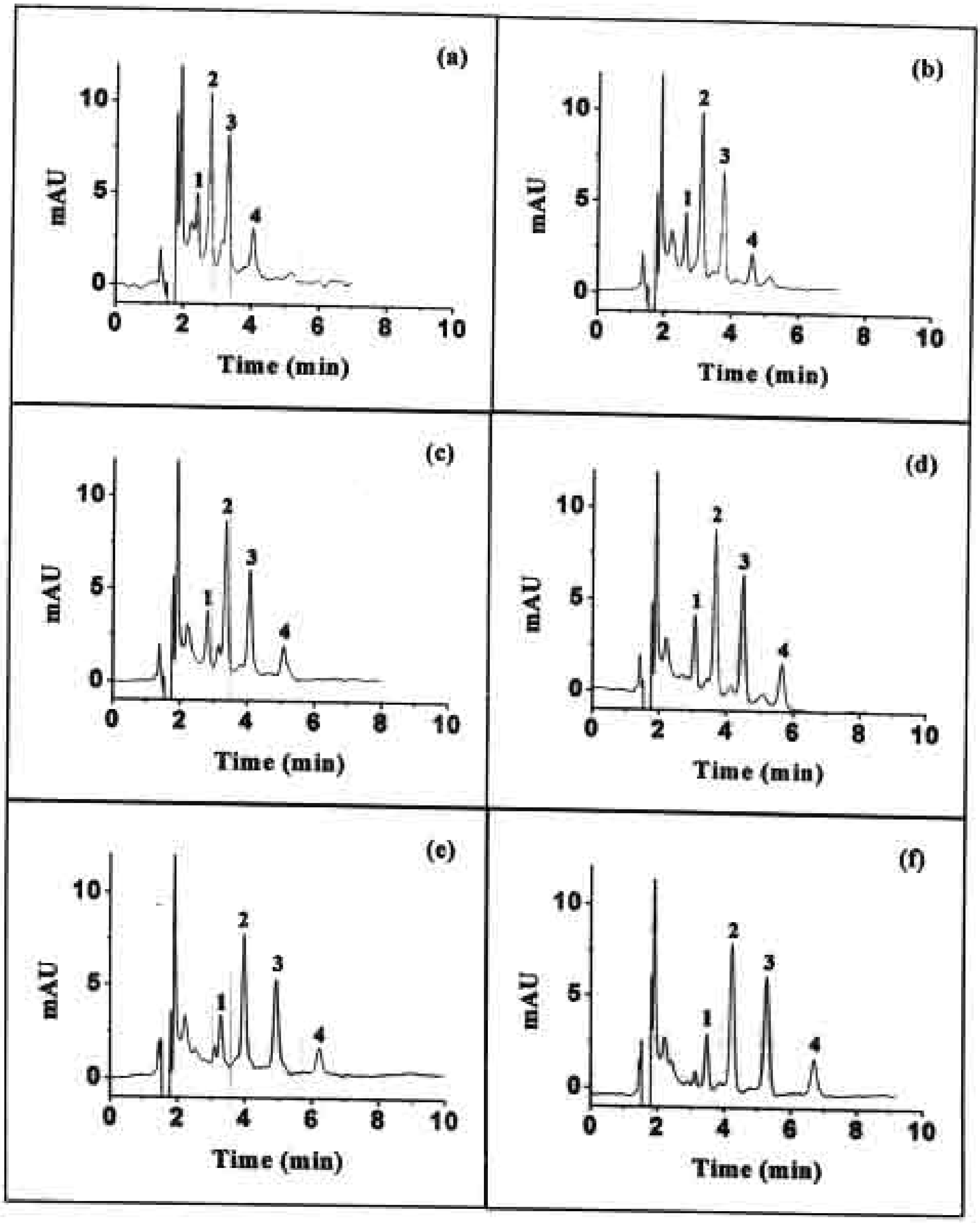

Fig. 6 Chromatograms of mixture of four LAS compounds obtained using 80% (v/v) methanol in water containing various concentrations of ammonium acetate: (a) 1, (b) 1.5, (c) 2, (d) 4, (e) 6 and (f) 8 mM. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

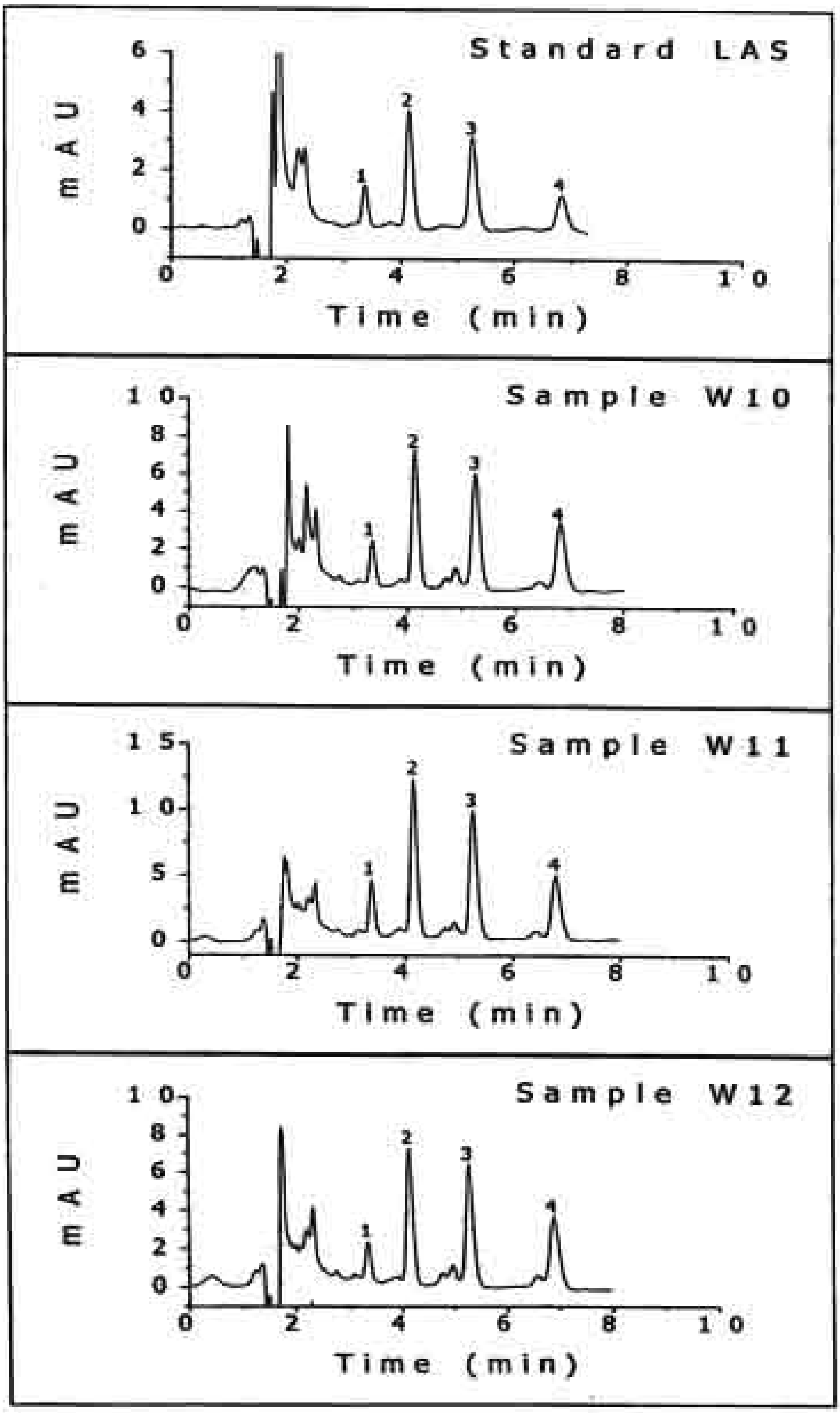

Fig. 7 Chromatograms of mixture of four LAS compounds in standard solution and water extracts obtained using 78% (v/v) methanol in water containing 1.5 mM ammonium acetate. Peak identification: (1) C_{10} LAS, (2) C_{11} LAS, (3) C_{12} LAS and (4) C_{13} LAS.

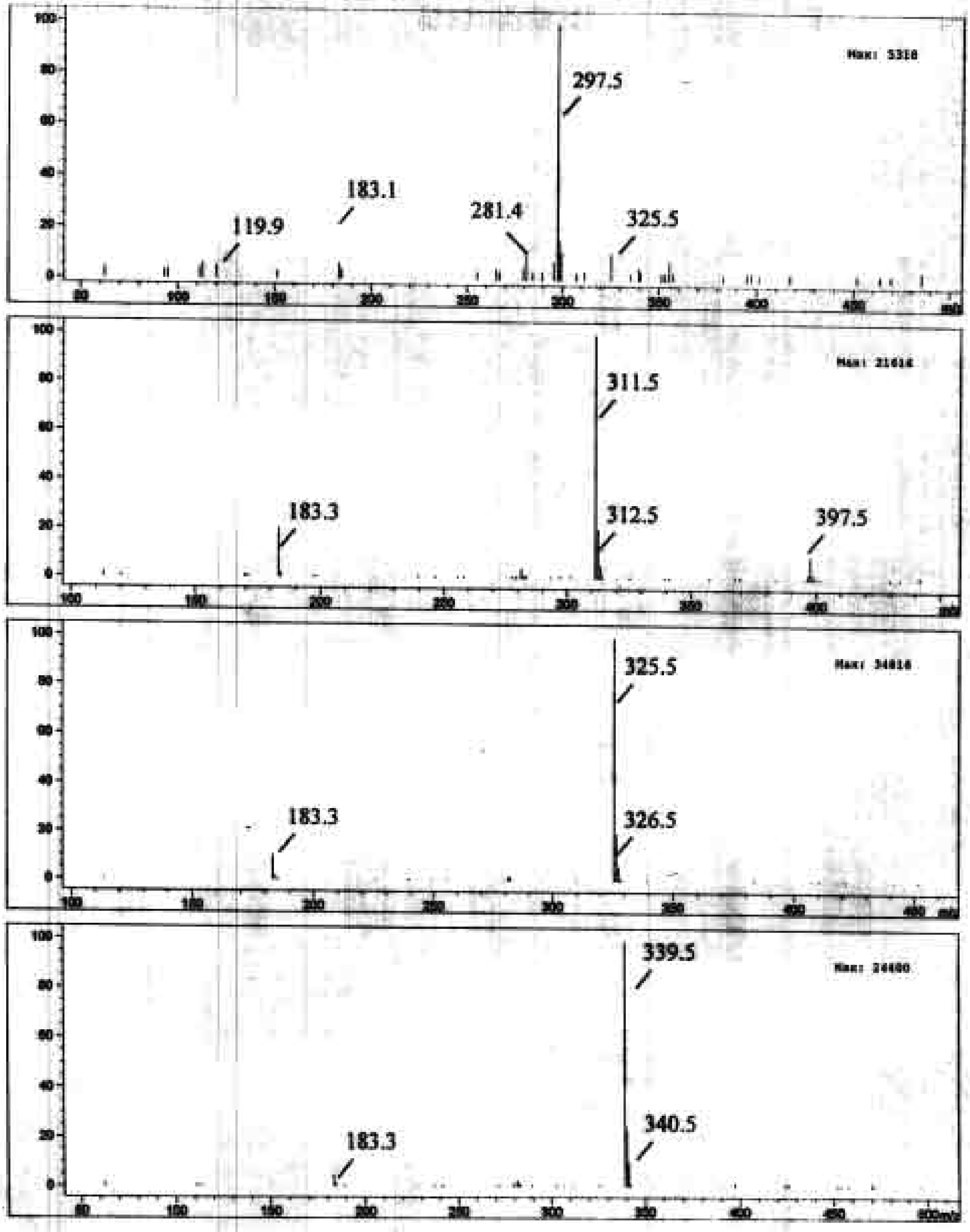

Fig. 8 Negative ion ESI mass spectra of LAS compounds originating from water extract (W 10)

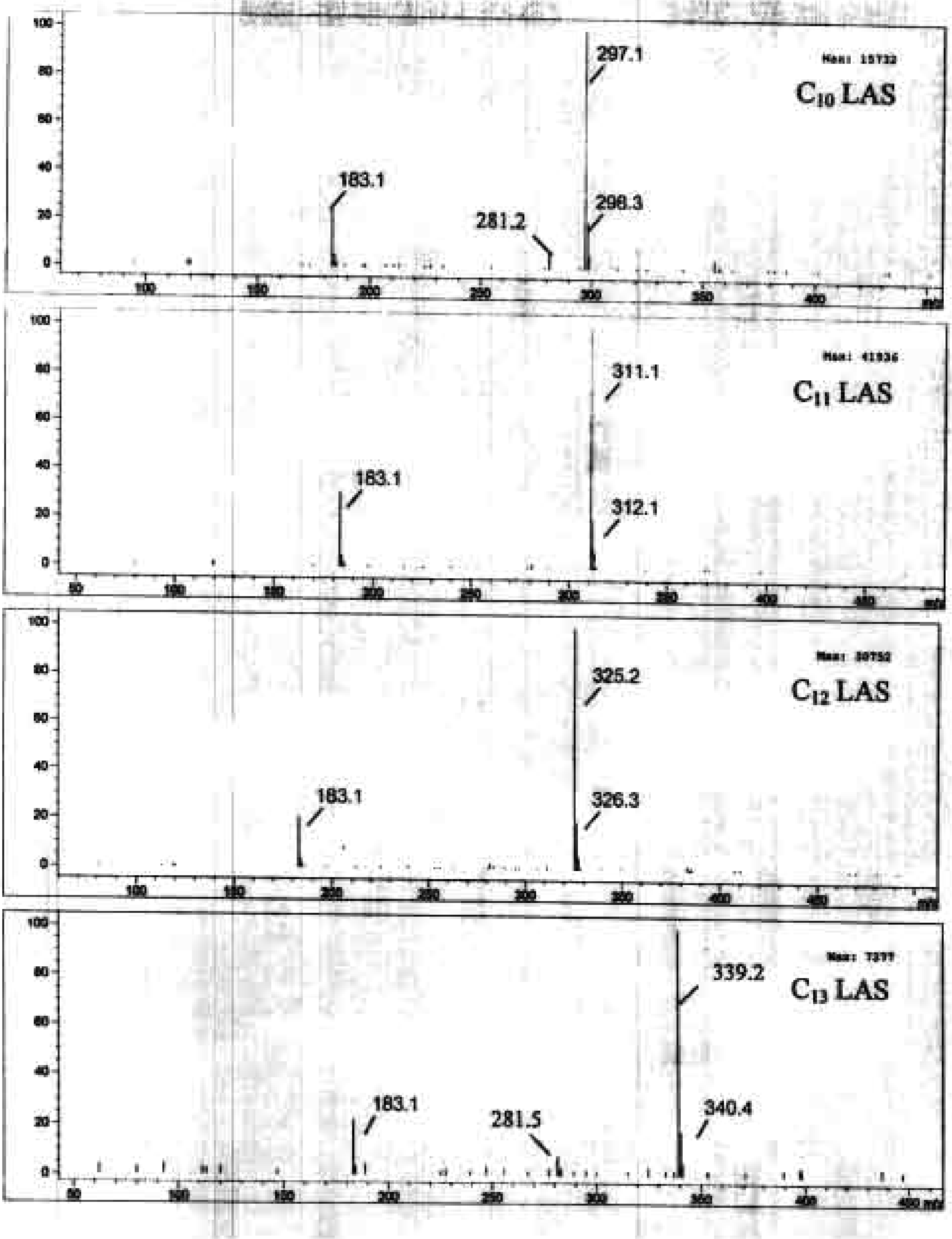

Fig. 9 Negative ion ESI mass spectra of the molecular ion originating from the mixture of LAS standard.

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Going with the flow

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11th International Conference on Flow Injection Analysis (ICFIA 2001), Chiang Mai, Thailand, December 16–20, 2001.

1. Introduction

This conference started informally in the USA in 1987 as the Winter Conference on Flow Injection Analysis (WCFIA), organized by Gary Christian, Gil Pacey and Jarda Ruzicka. The first conference was held in Orlando, Florida, and subsequent conferences were held also in Scottsdale, Arizona, Marathon, Florida, and San Diego, California as well as Orlando.

The conference grew and attracted numerous international participants, and, in 1995, the name was changed to the International Conference on Flow Injection Analysis, with the initial ICFIA meeting being held in Seattle, Washington, in August. At the same time, the Japanese Association for Flow Injection Analysis (JAFIA) was invited to join the conference, and they have held their semi-annual meeting jointly with ICFIA since. ICFIA 2001 was held jointly with the 38th Semi-annual meeting of JAFIA.

Since 1998, the conference venue has been held outside the USA. The 10th ICFIA was held in Prague, Czech Republic, in June 1999, hosted by Charles University Faculty of Pharmacy and organized by Miroslav Polasek and Petr Solich.

An international steering committee was formed, chaired by Gary Christian, and includes José Luis Burguera (Venezuela), Kate Grudpan (Thailand), Bernard Lendl (Austria), Ian McKelvie (Australia), Shoji Motomizu (Japan, JAFIA), Jarda Ruzicka (USA), Tadao Sakai (Japan, J. Flow Injection Anal.), Rolf Sara (Finland), and Koos van Staden (South Africa), with Sue Christian as Advisor. The Steering Committee is charged with selecting international venues and dates for the conference.

ICFIA 2001 was hosted by Chiang Mai University in Northern Thailand, and was ably organized by Professor Kate Grudpan and his colleagues in the Department of Chemistry. There were 120 participants from 21 countries. President Nipon Tuwanon officially opened the conference with the traditional striking of a gong, which was followed by traditional dancing and a drum show. The conference was proclaimed in honor of Kate Grudpan, in recognition of his being named the Outstanding Scientist of the Year in Thailand for 2001, the first time in the 19-year history of the award that it was given to a scientist from outside Bangkok.

The technical program consisted of 36 oral presentations over three-and-a-half days and 72 posters. This report summarizes the oral presentations. A copy of the entire list of oral and poster presentations can be obtained by contacting Gary Christian at christian@chem.washington.edu. The E-mail addresses of authors can also be provided, if senders wish to obtain further information about a specific paper.

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2. Instrumentation

The opening lecture, "Microsequential Injection: A Versatile Approach to (Bio)chemical Assays Using Lab-on-valve System", by J. Ruzicka (University of Washington, USA), was well presented by E.H. Hansen (The Technical University of Denmark), since Professor Ruzicka was unable to attend. The applicability of the lab-on-valve system was presented, including use with bead injection.

S. Motomizu (Okayama University, Japan, and President of the JAFIA) reported on a portable microflow system capable of parts per trillion detection limits (10^{-8} *M* spectrophotometry, 10^{-9} *M* fluorometry) as a result of having a very stable pump system. Flow channels are 0.25 mm, the pump stroke is 2.5 µl, and the flow cell is 8 µl.

P. Worsfold (University of Plymouth, UK) described a portable FIA system with chemiluminescence detection for shipboard monitoring of sub-nanomolar levels of cobalt, copper, and manganese in oceanic waters. Metals were concentrated on microcolumns of immobilized 8-hydroxyquinoline to achieve selectivity. A tangential flow filter was used to filter turbid waters.

M. Zenki (Okayama University of Science, Japan) described a closed-loop, cyclic FIA system that allows recycling of reagents that are present in excess. More than 300 repetitive determinations of chloride and calcium ions gave good reproducibility and no baseline drift. H. Itabashi (Guma University, Japan) described an all-injection analysis system in which all reagent solutions are injected into a reaction coil and all solutions are circulated for a definite time. The system minimizes reagent consumption and different analytical reaction systems can be utilized without rearranging the construction of the FIA assembly.

P. Ampan (Chiang Mai University, Thailand) described an in-valve minicolumn packed with ion-exchange resin for on-line sample pre-separation and pre-concentration. The column was placed directly in the spectrometer for direct measurement of iron(II) 1,10-phenanthroline, with the resin discarded after each run. An FI system with bead injection (BI) was also developed.

K. Oguma (Chiba University, Japan) incorporated photo-induced reactions for oxidizing Fe(II) to Fe(III). Measurements before and after irradiation allowed determination of Fe(III) and Cu(II) or Pd(II) in mixture.

3. Sequential injection analysis (SIA)

J. F. van Staden (University of Pretoria, South Africa) described various configurations of SI and FI to achieve multi-component analyses. He used SIA for the simultaneous determination or speciation of metal ions, inorganic anions, and organic compounds.

T. Imato (Kyushu University, Japan) used microbeads immobilized with antibodies for the SI photometric determination of the endocrine disruptor, vitellogenin.

A. Ivaska (Åbo Akademi University, Finland) determined Fe(II) and Fe(III) in pickle baths using automated SIA.

J. Jakmunee (Chiang Mai University, Thailand) used voltammetric detection for the SIA simultaneous determination of Cd^{2+}, Cu^{2+}, Pb^{2+}, and Zn^{2+}.

4. Atomic spectroscopy/mass spectrometry

The separation and pre-concentration of trace metals was used by several investigators prior to measurement.

M. Burguera (Los Andes University, Venezuela) determined total and soluble silica in water by ETAAS using on-line dilution for total silica followed by precipitation with ammonium chloride and collection on the walls of a knitted coil and then dissolution to determine soluble silica.

J. L. Burguera (Los Andes University, Venezuela) developed on-line FIA microwave assisted mineralization and on-line precipitation for determination of 3 ppb Mo in 0.5 ml serum.

The enrichment in the knotted coil was 3.5-fold with a detection limit of 0.1 ppb in the sample.

Y. Zolotov (Lomonosov Moscow State University, Russia) used on-line combination of FI sample pretreatment and atomic spectroscopy determination. Solid-phase extraction was used for hydrophobic species and stable complexes. Cd, Co, Cr, Cu, Fe, Mn, Mo, Pb, V, Zn, rare earths and noble metals were determined in waters, soils, food-stuffs, ores and alloys using FIA with FAAS, FAF, and AES-ICP.

E. H. Hansen (The Technical University of Denmark) described pre-concentration/separation using liquid-liquid extraction, (co)precipitation in knotted reactors, adsorption, hydride generation, or ion-exchange columns, for measurement by ETAAS or ICP/MS.

S. Hirata (The National Institute of Advanced Industrial Sciences Technology, Japan) determined rare earth elements in seawater by on-line pre-concentration followed by elution with 0.7 *M* HNO_3 into an ICP/MS for measurement.

M. Bloomfield (GlaxoSmithKline Consumer Healthcare, UK) reported on current developments and applications for monitoring drug release, degradation products, and amine drugs, with emphasis on the use of FIA for process methodology, with coupling with mass spectrometry.

5. Electrochemistry

B. Deore (Yamaguchi University, Japan) reported on a triple-pulse amperometric detection of underivatized amino acids at a polypyrrole modified copper electrode. The partially overoxidized polypyrrole film allowed measurements in acid mobile phase, rather than the alkaline medium normally required.

N. Wangfuengkanagul (Chulalongkorn University, Bangkok, Thailand) described the determination of penicillamine using a boron-doped diamond (BDD) thin-film electrode in an FIA system. The BDD electrode provides a much larger response compared with a glassy carbon electrode.

R.-I. Stefan (University of Pretoria, South Africa) developed a high-throughput SIA screening of chiral drugs using unique potentiometric and amperometric carbon paste enantioselective membrane electrodes, based on either selective binding or catalytic selectivity.

M. Trojanowicz (Warsaw University, Poland) gave the closing lecture – on the FI amperometric determination of selected pesticides based on inhibition of immobilized acetylcholinesterases of different origin.

6. Luminescence

P. Francis (Deakin University, Australia) used the recently developed pulsed-flow chemistry approach for chemiluminescence reactions. A pulsed-flow module develops short pressure pulses to generate precisely timed bursts of solution flow, interspersed with longer periods when the solution remains static. The digital flow profile avoids flow-rate variation problems, and solution ratios are easily varied.

S. Nakano (Tottori University, Japan) determined V(IV) and total vanadium by FI chemiluminescence based on catalysis of the oxidation of purpurogallin with periodate.

T. Sakai (Aichi Institute of Technology and Editor, J. Flow Injection Anal.) reported on the analysis of trace amounts of indoor formaldehydes, using a fluorometric FI measurement.

7. FI applications

Several variations of FI were used for specific applications.

Kate Grudpan (Chiang Mai University, Thailand) emphasized the cost-effectiveness gained by employing flow-based techniques in analytical problem solving in Thailand, including Cr(III/VI) speciation, sample pretreatment, and use of unstable reagents. He gave an excellent historical account of how FIA was introduced in the South Pacific area of the world, with early contributions from his laboratory.

D. Nacapricha (Mahidol University, Bangkok, Thailand) determined total iodine using a kinetic approach, based on the catalytic effect of iodide on the Ce(IV)/As(III) reaction. In-line reduction of iodate was employed.

J. Itoh (Kitami Institute of Technology, Japan) utilized the inhibition effects of some metals on the ascorbic acid-copper-porphyrin reaction system for the sensitive kinetic determination of Cr(VI), Fe(III), V(V), and Hg(II).

N. Teshima (Aichi Institute of Technology, Japan) determined copper and iron photometrically in serum using long-path absorption cells, with damper coils placed before detection to provide a smooth baseline.

I. McKelvie (Monash University, Australia) disclosed a number of new FI techniques to study the aquatic phosphorus cycle, by determining inorganic and organic species.

J. Simon (Free University of Berlin) used chromatomembrane cells for sample pretreatment for PAH and EOX monitoring in wastewater.

8. Separations

M-R. Fuh (Soochow University, Taipei, Taiwan) determined free-form amphetamine in rat's blood by in-vivo microdialysis and liquid chromatography with fluorescence detection. The pharmacokinetics of amphetamine was examined.

P. Sutthivaiyakit (Kasetsart University, Bangkok, Thailand) determined polyphosphates in seafood by indirect spectrophotometric chromatography, using an anion-exchange column with UV measurement at 285 nm.

R. Chantiwas (Chiang Mai University, Thailand) reported on the use of gravitational field-flow fractionation in combination with FIA for sized-based speciation of silica particles. Iron on the particles was monitored by reverse-flow injection chemiluminescence or by ETAAS.

B. Karlberg (Stockholm University, Sweden) described titration and extraction in CE capillaries, in a miniaturized, monosegmented flow analysis system. Weak acids were titrated and pK_a values determined in the range 3–6, using pH indicators and spectrophotometric detection. A sample volume of less than 250 nl is required. Octanol/water partition coefficients were screened with the system using 3 µl aqueous sample and 110 nl of organic phase.

The 72 posters presented numerous examples of innovative flow techniques and applications. Titles may be found in the complete program, which is available from Gary Christian on request.

9. Social program

A wonderful Thai cultural evening was enjoyed on Tuesday evening, with a Khan Toke dinner, traditional Northern Thai music and hill tribe dancing by students from the Chiang Mai College of Dramatic Arts.

Wednesday afternoon was free for touring and sightseeing, with all participants invited to an elephant camp, and the Queen Sirikit Botanic Garden, a true gem of the country. That evening, refreshments were enjoyed at the Chiang Mai University Science Faculty Observatory, where we were able to stargaze, and plan for the next conference. Some participants were still seeing stars the next morning.

10. Publication

Manuscripts of presentations and posters submitted by participants will be reviewed for publication in a special issue of *Talanta*.

11. Sponsors and exhibitors

The conference was sponsored and supported by Chiang Mai University, Thailand, the Japanese Association for Flow Injection Analysis (JAFIA), the British Council, the Chemical Society of Thailand, the Post-graduate Education and Research Program in Chemistry (PERCH), the Science Society of Thailand (Chemistry and Northern Divisions), the Thai

Ministry of University Affairs, the Thailand Research Fund (TRF), Constellation Technology, Corp., FIAlab Instruments, Inc., Foss Tecator, Metrohm Siam Co., Ltd., Perkin Elmer, Inc., and Thai Unique Co., Ltd. (Lachat).

12. 12th ICFIA

The Steering Committee has selected the next venue for the ICFIA to be Los Andes University in Mérida, Venezuela. Pioneering FIA colleagues José Luis Burguera and Marcella Burguera have graciously agreed to organize and host the conference. Professors J. F. (Koos) van Staden and Raluca-Ioana Stefan from The University of Pretoria will be co-organizers, in charge of the technical program. The tentative date is 7–11 December 2003, a very pleasant time of year in this beautiful sub-tropical country. Information will be posted at www.flowinjection.com, and direct contacts are burguera@ciens.ula.ve and koos.vanstaden@chem.up.ac.za

Meeting report v2

Trends in Analytical Chemistry, Vol. 23, No. 2, 2004

Pioneers host success high in the Andes

Report on 12th International Conference on Flow Injection Analysis (ICFIA 2003), Mérida, Venezuela, 7–13 December 2003

Gary D. Christian*

1. Introduction

Following the 11th ICFIA held in Chiang Mai, Thailand, in December 2001, the 12th ICFIA was hosted by Professors Jose Luis Burguera (Co-organizer) and Marcela Burguera (Co-secretariat) from Los Andes University (Universidad de los Andes), Mérida, Venezuela. The local organizing committee also included P. Carrero, M. Gallignani, Y. Petit, C. Rondon and M.R. Brunneto, with able assistance from their students. The conference was held jointly with the Japanese Association for Flow Injection Analysis (JAFIA). There were 18 countries from five continents represented.

2. Social events

Opening ceremonies were held on Sunday evening (7 December 2003) at the University's Aula Magna (Great Hall). Rector Genryi Vargas formally welcomed participants, and Dean of the Faculty of Sciences Patricia Rosenzweig expressed her appreciation and support for the conference. As Chair of the conference International Steering Committee, I expressed the appropriateness of holding the conference in Venezuela, since the Burgueras are pioneers in the early development of flow injection analysis (FIA). Jose Luis Burguera welcomed all to the conference and the city of Mérida. The participants were then treated to a string quintet concert before adjourning for a fine reception.

On Monday evening, we were treated to a show of Venezuelan dancers with colorful costumes.

On Wednesday, all participants went on a fascinating tour to the high country in the Andes, which at 4100 m, literally took our breath away.

A gala banquet was held Thursday evening. It began with a demonstration of Latin American dances and concluded with participants dancing to Mexican and Venezuelan music late into the evening.

3. JAFIA's 20th Anniversary and Awards

The JAFIA celebrated its 20th anniversary in 2003. Shoji Motomizu, President of JAFIA, and Tadao Sakai, Editor of the Japanese *Journal of Flow Injection Analysis* (*JFIA*) presented a pictorial history and account of the Association and important contributors to *JFIA*.

The occasion of the ICFIA was used as the venue for presenting the annual JAFIA awards (for 2003). Professor Kate Grudpan, Chiang Mai University, was awarded the JAFIA Scientific Award medal and Professor Duangjai Nacapricha, Mahidol University, received the JAFIA Best Article Award medal for a paper in *JFIA*. Professors Elo Hansen, Jacobus (Koos) van Staden, Jose Luis Burguera and I were greatly honored to receive the JAFIA Scientific Honor Award medal and certificate, which JAFIA and the Division of the Japan Society for Analytical Chemistry (JSAC) grant only every five years, and Sue Christian was specially honored with the JAFIA Special Gold Medal for her years of contributions and devotion to the Conference. These awards were particularly special as 20th anniversary recognitions.

4. Scientific program

4.1. Plenary lectures

Professor Jacobus (Koos) F. van Staden (Co-organizer) and Raluca-Iona Stefan (Co-secretariat) of the University of Pretoria arranged the scientific program that began on Monday morning and concluded Friday afternoon.

It was opened, with the first of 14 Plenary Lectures, by E.H. Hansen (Technical University of Denmark) who spoke on the impact of FIA on modern analysis.

Plenary lectures throughout the week included presentations on:

- the compact disc analyser, by J.F. van Staden;
- development of flow-bio-detection amperometric sensors for food and cosmetics analysis, by M.I. Karayyannis (University of Ionnina);
- multi-pumping flow systems for automation, by J. L. F. Costa Lima (Universidade do Porto); and,

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- determination of trace impurities in ultrapurified waters and chemicals at parts per trillion levels by flow-based analysis, by S. Motomizu (Okayama University).

M. Burguera presented a comprehensive, informative lecture on analytical applications of organized media for on-line spectrometric determinations of parts per trillion metal ions; T. Sakai (Aichi Institute of Technology) described the development of new devices for FI detection for environmental and biological analysis. A. Ivaska (Åbo Akademi University) presented a sophisticated mathematical modeling of flow-injection systems in straight tubes, including sequential injection analysis; and, I traced the origins of analytical chemistry and the development of analytical methods and textbooks that led up to the development of FIA-based techniques.

J. van Staden presented Raicua-Iona Stefan's Plenary Lecture in her absence; it was on the use of electrochemical sensors for multi-component analyses in flow systems, particularly for measuring enantiomers. V. Cerda (Universitat de les Iles Balears) described a flexible multi-syringe, multivariate system for multicommuted FIA (MCFIA), along with sophisticated Windows-based software for instrument control and data acquisition. K. Grudpan described novel, low-cost, flow-based systems, including the "Lab-at-Valve" concept, in which a detection device is attached to one port of a conventional multi-position selection valve. E. Zagatto (Universidade de São Paulo, Piracicaba) emphasized the importance of exploiting prior assays for reducing the number of analyses needed. For example, low molybdenum content in plants results in low nitrogen fixation. Analyzing for molybdenum only for plants with low nitrogen (an easier analysis) increases the efficiency of the laboratory.

The Plenary Lectures concluded with a comprehensive presentation of the use and power of FTIR (Fourier-transform infrared spectroscopy) in flow analysis, by M. Gallignani (University of Los Andes).

4.2. *Oral presentations*

There were 25 lectures covering various aspects of flow analysis, including novel developments in instrumentation, and spectrophotometric, luminescence, atomic spectrometric, and electrochemical applications.

4.2.1. Spectrophotometry. Optical methods continue to represent the majority of FIA-based applications. B. Karlberg (Stockholm University) described how IR detection in microflow systems, including capillary electrophoresis, achieved picogram detection.

F. Suliman (Sultan Qaboos University) reported on an optical sensor for micro-sequential bead injection analysis, with 9 ppb detection for aluminum.

Simultaneous determination and speciation of heavy metals in waters was presented by V. Cerdà, using on-line UV oxidation of organic matter.

Multivariate analysis was used to subtract free ligand contributions. J. van Staden used SIA (sequential injection analysis) for metal ion, inorganic anion, and organic compound speciation.

M. Almeida (Universidade Católica Portuguesa) speciated phosphorus species in environmental samples, using microwave oven digestion for total phosphorus determination.

S. Meneses (Universidade de São Paulo, Piracicaba) determined sulfate in soil extracts at the µg/L level, based on reaction with the barium-dimethylsulfanazo (III) complex.

K. Oguma (Chiba University) reported on the determination of bromate and iodate by oxidation of the iron(II)-1,10-phenanthroline complex. Bromide and iodide were differentiated by reaction with chlorite at selected pH values.

M. Bloomfield (GlaxoSmithKline Consumer Healthcare, UK) reported on the assay for peroxide in healthcare products, along with the necessary validation challenges for the industry.

M. Zenki (Okayama University of Science) described the repetitive determination of ascorbic acid in the presence of oxidants using a novel circulatory flow injection system and an inhibitor; 300 repetitive determinations could be made with a 50 mL reservoir.

J. Prior (Universidade do Porto) determined antithyroids by reaction with Pd(II), with UV detection, or by the inhibitory effect on the Pd(II) catalyzed reaction between pyronine G and hypophosphite ions, monitored at 548 nm.

H. Ukeda (Koichi University) determined the antioxidant capacity of compounds in food based on scavenging of the ABTS radical cation (ABTS= 2,2-azinobis(3-ethylbenzthiazoline-6-sulfonate)).

J. Liu (Kitami Institute of Technology) described the kinetic determination of sulfhydryl thiols based on their catalytic effect on the reaction of the ttmap (5,10,15,20-tetrakis[4-(N-trimethylammonio) phenyl]) porphyrin with copper ions.

A. Cáceres (La Universidad del Zulia) described the on-line analysis of linear alcohols using microwave-assisted derivatization.

4.2.2. Luminescence. Y. Iida (Kanagawa Institute of Technology) determined urea in alcoholic beverages using an acid-urease column and fluorometric detection of isoindole derivative from the ammonia produced.

D. Nacapricha (Mahidol University) used gas-diffusion FI for the selective determination of iodide in pharmaceutical products, using the iodine-luminol reaction for detection.

T. Imato (Kyushu University) used magnetic microbeads and chemiluminescence detection for the immunoassay of the endocrine disruptor, vitellogenin, in fish.

4.2.3. Atomic spectrometry. P. Carrero (University of Los Andes) determined bismuth in urine by successive retention of Bi(III) and tetrahydroborate(III) on an anion exchange resin for hydride generation AAS.

J. Chirinos (Universidad Central de Venezuela) described fast, on-line determination of selenium by hydride generation and ICP-OES (inductively coupled plasma optical emission spectroscopy) measurement.

4.2.4. Electrochemistry. J. Jakmunee (Chiang Mai University) reported on an on-line standard addition sequential injection method for the simultaneous determination of four metal ions using anodic stripping voltammetry.

T. Nagaoka (Osaka Prefecture University) used a boron-doped, diamond-coated electrode, coated with a molecularly imprinted polymer, for the selective voltammetric determination of amino acids at +2.0 V vs. Ag/AgCl.

O. Chailapakul (Chulalongkorn University) used an anodized, boron-doped, diamond thin-film electrode to determine tetracycline antibiotics, with a 10-nM detection limit. The diamond electrodes exhibit low background and enhanced stability, as well as wider potential range, compared with glassy carbon electrodes.

K. Vytras (University of Pardubice) reported on the development of biosensors based on carbon-paste substrates modified with a manganese dioxide powder mediator for detecting H_2O_2 in enzymatic reactions. Disposable screen-printed electrodes can be prepared, with enzyme entrapped in Nafion.

I. Satoh (Kanagawa Institute of Technology) described the electrochemical removal of zinc ions from immobilized alkaline phosphatase; injection of a sample containing zinc ions regenerated the enzyme activity, and the reversible process was used for the determination of nanomolar concentrations of zinc ions, with spectrophotometric detection.

H. Tanaka (Tokushima University) described a new concept: feedback-based flow ratiometry to determine acid/base dissociation constants, using a pH glass electrode for detection.

4.2.5. Analytical Sciences Digital Library. I introduced participants to the US National Science Foundation-sponsored Analytical Sciences Digital Library (ASDL), a new website database of URLs dealing with all aspects of analytical chemistry. The websites are peer reviewed for content and relevance; they cover categories such as pedagogy, laboratory experiments, techniques, and applications. The website is free: http://www.asdlib.org/.

4.3. Poster presentations

There were over 60 poster presentations by participants form Brazil, Greece, Japan, Oman, The Philippines, South Africa, Spain, Turkey, Thailand, Uruguay, USA, and Venezuela.

The breadth of flow-based techniques was well illustrated by posters on automation, SIA, on-line pre-concentration, separation, reactions and sample clean-up, membrane separations, microwave-assisted derivatization and sample preparation, multi-component analyses, chemometrics, catalytic and kinetic methods, stopped-flow reactions in a mixing coil, electrochemical and biosensor detection, and FTIR, fluorescence, spectrophotometric, and vapor-phase atomic absorption detection. Applications to a variety of samples were reported, including pharmaceutical products, environmental samples, gasoline, oil, and soil extracts.

4.3.1. Best Poster Awards Certificates for the most outstanding posters for each of the three sessions were awarded to:

- Mürvet Volkan (Middle East Technical University, Ankara, Turkey);
- Moisés Knochen (Universidad de la Republica, Montevideo, Uruguay); and,
- Ricardo Rivas (Universidad Centro Occidental Lisandro Alvarado, Barquisimeto, Venezuela).

4.4. Publication of the Proceedings

Papers at the conference will be submitted for a Special Issue of *Talanta*, with Guest Editors J.L. Burguera and J.F. van Staden.

5. ICFIA 13

After considering several sites, members of the Steering Committee (M. Bloomfield, J.L. Burguera, K. Grudpan, S. Motomizu, T. Sakai, J. van Staden and I, and S. Christian, Advisor) selected the USA for the next conference, to be held in 2005. For details, please contact Sue Christian (E-mail: sue@flowinjection.com).

ภาคผนวก ค

ข่าวจากหนังสือพิมพ์

นักวิทยาศาสตร์มช.สร้างชื่อ JAFIAญี่ปุ่นมอบรางวัลสูงสุด

ข่าวจากมหาวิทยาลัยเชียงใหม่(มช.) แจ้งว่า สมาคมโฟลอินเจ็กชั่นอะนาลิซิสแห่งประเทศญี่ปุ่น (Japanese Association for Flow Injection Analysis) หรือ JAFIA มอบเหรียญรางวัลสูงสุด พร้อมประกาศนียบัตรของสมาคมแก่ รองศาสตราจารย์ ดร.เกตุ กรุดพันธุ์ อาจารย์ภาควิชาเคมี คณะวิทยาศาสตร์ มช. จากผลงานการพัฒนาระบบวิเคราะห์ทางเคมีที่ใช้การไหลที่มีประสิทธิภาพสูงราคาประหยัด(Development of Cost-Performance Flow-based Chemical Analysis Systems) โดยจัดพิธีมอบประกาศนียบัตรในการประชุมทางวิชาการครบรอบ 20 ปี และการประชุมทางวิชาการครั้งที่ 44 ที่มหาวิทยาลัยโอกายามา เมืองโอกายามา ประเทศญี่ปุ่น

นอกจากนี้ได้จัดพิธีมอบเหรียญรางวัลในการประชุมวิชาการนานาชาติ 12 th International Conference on Flow Injection Analysis and Related Technique(12 th ICFIA) ที่เมืองเมริดา ประเทศเวเนซุเอลา รางวัลดังกล่าวถือเป็นรางวัลสูงสุดของสมาคมที่มอบให้กับนักวิทยาศาสตร์ชั้นนำในระดับนานาชาติ โดยรองศาสตราจารย์ ดร.เกตุ กรุดพันธุ์ ได้รับเชิญเป็นผู้บรรยายเรื่องพัฒนาการใหม่ ทางการวิเคราะห์ที่ใช้การไหล ที่มีราคาประหยัด (Development of Cost-Performance Flow-based Chemical Analysis Systems) ในการประชุมวิชาการครั้งนี้ด้วย

รองศาสตราจารย์ ดร.เกตุ กรุดพันธุ์ เป็นผู้มีผลงานทางวิชาการจำนวนมาก เคยได้รับรางวัลเมธีวิจัยรุ่นที่ 1 (2537-2540) รางวัลเมธีวิจัยอาวุโส(2544-2546) รางวัลนักวิจัยดีเด่นแห่งชาติ สาขาวิทยาศาสตร์เคมีเภสัช ของสภาวิจัยแห่งชาติ เป็นนักวิจัยคนแรกของภูมิภาคที่ได้รับรางวัลนักวิทยาศาสตร์ดีเด่นจากมูลนิธิส่งเสริมวิทยาศาสตร์และเทคโนโลยีในพระบรมราชูปถัมภ์ ปี 2544 และได้รับรางวัลเกียรติยศทางวิชาการทั้งในระดับชาติ และระดับนานาชาติอีกหลายรางวัล

หนังสือพิมพ์มติชนรายวัน ประจำวันพุธที่ 25 กุมภาพันธ์ 2547 หน้า 21

ภาคผนวก ง

Program ของ Annual Symposium on TRF Senior Research Scholar on Flow-based Analysis

The 1st Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis

The 1st Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis

At Buares–Kamthong Room,
Department of Chemistry, Faculty of Science,
Chiang Mai University

8.30 - 9.00	**Registration**
9.00 - 9.15	**Opening session** - "Symposium Objectives" by Assoc. Prof. Dr. Kate Grudpan, TRF Senior Scholar - Welcoming address by Head of Chemistry - Address by Dean, Faculty of Science - Address by Director, Institute for Science and Technology Research and Development - Address by Director, Basic Research Division, TRF - Opening address by Director, TRF
9.15 - 10.15	**Plenary lecture** "Advanced Chemical Analyses Using Flow-Based Techniques" by Prof. Dr. Shoji Motomizu, Department of Chemistry, Faculty of Science, Okayama University and President, The Japanese Association for Flow Injection Analysis (JAFIA), JAPAN.
10.15 - 10.45	**Break**
10.45 – 11.15	"Some Recent Development on Flow-Based Analysis in Thailand : Examples from the TRF Senior Research Scholar Grant" by Assoc. Prof. Dr. Kate Grudpan
11.15 - 11.35	"Simply Tri-Iodide Starch Chemistry in Flow Injection" by Assist. Prof. Dr. Duangjai Nacapricha
11.35 - 11.55	"Flow Injection Voltammetric Systems with Repeated Use of Mercury Film for Simultaneous Determination of Cd Cu Pb and Zn" by Dr. Jaroon Jakmunee
12.00 - 13.00	**Lunch**
13.00 - 13.20	"Electrochemical Determination of Tetracycline Antibiotics by Pulsed Amperometric Detection Applied to Flow Injection System" by Assist. Prof. Dr. Orawon Chailapakul
13.20 - 13.40	"Flow Based-Reduced Volume Column System for Thalassemia Screening" by Dr. Supaporn Kardtap Hartwell
14.00 - 15.30	**Poster session / Break**
15.30 – 16.00	**Discussion / Comments**

Poster Session

uster N	Name	Title
P-01	Duangjai Nacapricha	USE OF IODINE-STARCH REACTION TO DETERMINE IODIDE IN A HIGHLY COLORED PHARMACEUTICAL PRODUCT
P-02	Kanokkarn Sa-nguanwong	DEVELOPMENT OF THE GRADIENT ELUTION FOR SEPARATION OF CHLORINE-CONTAINING ANIONS BY ION CHROMATOGRAPHY USING CONDUCTIVITY DETECTION
P-03	Kwuanjit Manee-on	DETERMINATION OF ETHANOL BY OSTERYOUNG SQUARE WAVE VOLTAMMETRY
P-04	Lop Patimapornlert	SEQUENTIAL INJECTION TITRIMETRY WITH LAB-ON-VALVE FOR ACIDITY IN FRUIT JUICE
P-05	Nathawut Choengchan	USE OF IODINE-STARCH REACTION IN FLOW INJECTION TO STDUY IODINE LOSS THROUGH THERMAL DIGESTION
P-06	Nattawan Kuppithayanant	MULTIPARAMETER OPTIMIZATION OF THE ULTRASONIC EXTRACTION FOR POLYCYCLIC AROMATIC HYDROCARBONS IN SOIL SAMPLES
P-07	Nathawut Choengchan	USE OF IODINE-STARCH COMPLEXATION FOR DETERMINATION OF IODATE IN IODIZED SALT BY FLOW INJECTION
P-08	Nichanan Tepsuparungsikul	SEPARATION OF POLYCHLORINATED BIPHENYLS USING GAS CHROMATOGRAPHY WITH AN ELECTRON CAPTURE DETECTOR
P-09	Orawan Tue-Ngeun	DETERMINATION OF IODATE IN IODIZED-TABLE SALTS BY USING FLOW INJECTION AMPEROMETRIC DETECTION
P-10	Parinya Masawat	FLOW INJECTION VOLTAMMETRIC DETERMINATION OF ACETAMINOPHEN IN PHARMACEUTICALS USING AN INEXPENSIVE FLOW-THROUGH CELL INCORPORATING WITH A PENCIL LEAD ELECTRODE
P-11	Pattanapong Ampan	COUPLING SEQUENTIAL INJECTION SYSTEM WITH LAB-ON-VALVE TO ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY FOR LEAD DETERMINATION BASED ON THE USE OF RENEWABLE MICROCOLUMN
P-12	Rattikan Chantiwas	SIZE-BASED IRON SPECIATION OF GOETHITE COATED SILICA PARTICLES BY GRFFF WITH FIA OR ETAAS
P-13	Rodjana Burakham	FLOW INJECTION AND SEQUENTIAL INJECTION SPECTROPHOTOMETRIC DETERMINATION OF PARACETAMOL IN PHARMACEUTICAL PREPARATIONS
P-14	Saisunee Liawruangrath	DEVELOPMENT OF A FLOW INJECTION SPECTROPHOTOMETRIC PROCEDURE FOR CADMIUM DETERMINATION
P-15	Sanit Palaham	ELECTROANALYSIS OF TETRACYCLINE IN PHARMACEUTICAL FORMULATION BY FLOW INJECTION SYSTEM
P-16	Saowapha Muangkaew	A REVERSE FIA METHOD FOR DISSOLVED OXYGEN DETERMINATION IN WATER SAMPLE
P-17	Siripat Suteerapataranon	STUDY OF COLLOIDS RELEASED FROM A CONTAMINATED SOIL BY FIFFF-ICP-MS
P-18	Jaroon Jakmunee	SIMULTANEOUS DETERMINATION OF PHOSPHATE AND SILICATE BY STOPPED FLOW INJECTION FOR KINETIC SEPARATION
P-19	Sombat Chowwanapoonpohn	RECOVERY OF ELECTROCOAGULATED PHENOLIC COMPOUNDS
P-20	Somchai Lapanantnoppakhun	FLOW INJECTION ANLYSIS FOR TRACE IRON IN BEER SAMPLES
P-21	Sunanta Wangkarn	ELUTION PROFILES OF ANIONIC AND CATIONIC SURFACTANTS
P-22	Supalax Srijaranai	ON-LINE COMPLEXATION OF SOME METALS PRIOR TO HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC ANALYSIS
P-23	Thanyarat Chuesaard1	FLOW INJECTION SPECTROPHOTOMETRIC DETERMINATION OF COPPER USING TETRACYCLINE
P-24	Waraporn som-aium	FLOW INJECTION ON-LINE PRECONCENTRATION OF Cr(VI) USING A COLUMN REACTOR PACKED WITH PTFE BEADS FOR THE ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION
P-25	Winita Punyodom	SOME TYPES OF CHITOSAN MEMBRANES FOR ON-LINE SEPARATION AND DILUTION
P-26	Wirat Ruengsitagoonb	FLOW INJECTION CHEMILUMINESCENCE DETERMINATION OF TETRACYCLINE
P-27	Woravit Chansuwan1	OPTIMIZATION OF SEQUENTIAL EXTRACTION METHOD FOR THE DETERMINATION OF SOME HEAVY METALS IN THE RIVER SEDIMENT SAMPLES

The 2nd Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis

The 2nd Annual Symposium on TRF Senior Research Scholar on
"Flow-based Analysis"
At Seminar Room ScB 2
Faculty of Science, Chiang Mai University
6th September 2003

8.15 - 8.30	Registration
8.30 - 8.45	**Opening session** - "Symposium Objectives" and "Progress on Development of Flow-based Analytical Techniques under the TRF Senior Research Scholar Project" by Assoc. Prof. Dr. Kate Grudpan, TRF Senior Research Scholar - Opening address by the Director, TRF (Prof. Dr. Piyawat Boon-long) - Address by the Director, Academic Division, TRF (Prof. Dr. Vichai Boonsaeng)
8.45 - 9.05	"Flow Injection Analysis for Determination of Trace Air Pollutants" by Prof. Dr. Tadao Sakai, Aichi Institute of Technology, JAPAN
9.05 - 9.25	"Ultratrace and Trace Determination with Flow-based Techniques" by Prof. Dr. Shoji Motomizu, Department of Chemistry, Faculty of Science, Okayama University, JAPAN
9.25-9.45	**Break**
9.45-9.55	Oral Presentation 1 (for poster nos. 1 - 3) Dr. Supaporn Kradtap Hartwell
9.55-10.05	Oral Presentation 2 (for poster no. 20) Miss Maliwan Amatatongchai
10.05-10.15	Oral Presentation 3 (for poster no. 21) Miss Teeraporn Charoenraks
10.15-10.25	Oral Presentation 4 (for poster no. 16) Dr. Jaroon Jakmunee
10.25-10.35	Oral Presentation 5 (for poster no. 22) Asst. Prof. Dr. Supalax Srijiranai
10.35-10.45	Oral Presentation 6 (for poster no. 10) Dr. Winita Punyodom
10.55-11.05	Oral Presentation 7 (for poster no. 7) Miss Siripat Suteerapataranon
11.05-11.15	Oral Presentation 8 (for poster nos. 11-12) Miss Lalida Srivichai
11.15-11.25	Oral Presentation 9 (for poster no. 9) Mr. Narong Lenghor
11.25-12.30	Discussion at Posters
12.30-13.30	**Lunch**
13.30-14.30	Discussion at Posters (Continued)
14.30-16.00	Discussion in overall

* Note Oral presentations:

(1) Some from the all posters presented

(2) Should be within 3 slides

List of Presentations

No.	Title
PL-01	FLOW INJECTION ANALYSIS FOR DETERMINATION OF TRACE AIR POLLUTANTS
PL-02	ULTRATRACE DETERMINATION WITH FLOW-BASED TECHNIQUES
P-01	DEVELOPMENT OF FLOW BASED-ION EXCHANGE MICRO-COLUMN SYSTEM FOR SCREENING OF THALASSEMIA AND HEMOGLOBINOPATHIES
P-02	FLOW BASED ON-LINE IMMUNOASSAY FOR HYALURONAN
P-03	DETERMINING THE RELATIVE AMOUNT OF SPECIFIC PROTEOGLYCANS BY FLOW INJECTION-AFFINITY MICRO-COLUMN SYSTEM
P-04	AUTOMATED SYSTEM FOR PARACETAMOL ASSAY
P-05	BEAD INJECTION-FLOW INJECTION SYSTEM, AN ECONOMIC ALTERNATIVE FOR DETERMINATION OF IRON AND COPPER AT TRACE LEVELS
P-06	A NOVEL METHOD FOR SIZE-BASED IRON SPECIATION OF CLAY SAMPLES
P-07	THE RELEASE OF METAL IONS FROM CONTAMINATED SOIL IN MINING AREAS TO THE ENVIRONMENT BY HUMIC ACID COLLOIDS
P-08	STOPPED –FLOW INJECTION ANALYZER FOR THE DETERMINATION OF PHOSPHATE IN FERTILIZER AND SOIL SAMPLES
P-09	DEVELOPMENT OF FLOW-SYSTEMS WITH DYNAMIC SURFACE TENSION DETECTORS
P-10	DEVELOPMENT OF SOME TYPES OF CHITOSAN MEMBRANES FOR ON-LINE SEPARATION AND DILUTION
P-11	QUALITATIVE AND QUANTITATIVE ANALYSIS OF LINEAR ALKYLBENZENE SULFONATES AND TRITON X-100 IN WATER SAMPLES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY
P-12	THE ANALYSIS AND CHARACTERIZATION OF SOME CATIONIC SURFACTANTS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY
P-13	DETERMINATION OF SOME CATIONS USING FLOW INJECTION-ION CHROMATOGRAPHY
P-14	DETERMINATION OF IODIDE USING FI-HPLC
P-15	INVESTIGATION ON ELECTROPHORESIS FOR SPECIATION OF Fe(II)/Fe(III)
P-16	DEVELOPMENT OF SOME ELECTROANALYTICAL INSTRUMENTATION/ METHODS
P-17	ON-LINE DERIVATIZATION SYSTEM WITH ELECTROCHEMICAL DETECTION FOR ETHANOL DETERMINATION
P-18	SOME ELECTROANALYTICAL SET-UPS FOR STUDENTS' LABORATORY EXERCISES
P-19	DETERMINATION OF IODIDE IN PHARMACEUTICAL SAMPLES BY GAS DIFFUSION FLOW INJECTION USING IODINE-STARCH REACTION
P-20	USE OF THE BORON DOPED-DIAMOND THIN FLIM ELECTRODE FOR DETERMINATION OF IODIDE ION
P-21	FLOW INJECTION ANALYSIS OF DOXYCYCLINE AND CHLORTETRACYCLINE IN PHARMACEUTICAL FORMULATIONS WITH PULSED AMPEROMETRIC DETECTION
P-22	ANALYSIS OF METALS USING REVERSE FLOW INJECTION COUPLED TO ION-PAIR REVERSED PHASE HIGH PERFORMANCE LIQUID CHROMATOGRAPHY
P-23	A NOVEL POTENTIOMETRIC DETERMINATION OF COPPER USING NAPHTHAZARIN CARBON PASTE ELECTRODE
P-24	DETERMINATION OF COPPER (II) ION BY SEQUENTIAL INJECTION ANALYSIS COUPLED WITH LAB-ON-VALVE
P-25	DETERMINATION OF COPPER(II) BY FLOW INJECTION ANALYSIS
P-26	DETERMINATION OF SUULPHITE AND SULPHATE IN BEVERAGES BY FLOW INJECTION ANALYSIS
P-27	FLOW INJECTION SPECTROPHOTOMETRIC DETERMINATION OF ACETAMINOPHEN IN ANALGESIC
P-28	FLOW INJECTION CHEMILUMUNESCENCE DETERMINATION OF TETRACYCLINE
P-29	CONTINUOUS FLOW PERVAPORATIVE MEMBRANE SAMPLING FOR HIGH SPEED GAS CHROMATOGRAPHIC ANALYSIS OF VOLATILE ORGANIC COMPOUNDS
P-30	ARSENIC SPECIATION BY ON-LINE CONTINUOUS FLOW HYDRIDE GENERATION-INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROMETRY (HG-ICP-OES)

The 3rd Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis

The 3rd Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis

At Seminar Room ScB. 2
Faculty of Science, Chiang Mai University
23rd September 2004

8.00 - 8.30	Registration
8.30 - 8.50	**Opening session** - "Symposium Objectives" and "Progress on Development of Flow-based Analytical Techniques under the TRF Senior Scholar Project" by Assoc. Prof. Dr. Kate Grudpan, TRF Senior Scholar - Opening address by The Director, Academic Division, TRF
8.50 - 9.20	"The Impact of Flow Injection on Modern Chemical analysis" by Prof. Dr. Elo Harald Hansen, Department of Chemistry, Technical University of Denmark, DENMARK
9.20 - 9.45	"Flow Injection Solvent Extraction for Some Water Monitoring" by Prof. Dr. Tadao Sakai, Aichi Institute of Technology, JAPAN
9.45 - 10.10	"Some Flow-Based Analyses for Air Monitoring" by Prof. Dr. Shoji Motomizu, Department of Chemistry, Faculty of Science, Okayama University, JAPAN
10.10 - 10.35	"Macronutrient Mapping in Estuarine and Marine Waters" by Flow Analysis" by Assoc. Prof. Dr. Ian McKelvie, Monash University, AUSTRALIA
10.35 - 10.50	*Coffee Break*
10.50 - 11.00	*Oral Presentation 1(for P-01, Dr. H. Itabashi)
11.00 - 11.10	*Oral Presentation 2 (for P-02, Dr. H. Ukeda)
11.10 - 11.20	*Oral Presentation 3 (for P-03, Dr. K. Higuchi)
11.20 - 11.30	*Oral Presentation 4 (for P-04, J. Promchan)
11.30 - 11.40	*Oral Presentation 5 (for P-05, M. Amatatongchai)
11.40 - 11.50	*Oral Presentation 6 (for P-06, T. Charoenraks)
11.50 - 12.00	*Oral Presentation 7 (for P-07-08, O. Tue-ngeun)
12.00 - 12.10	*Oral Presentation 8 (for P-09, S. Somnam)
12.10 - 12.20	*Oral Presentation 9 (for P-10-12, R. Burakham)
12.20 - 12.30	*Oral Presentation 10 (for P-13, Dr. J. Jakmunee)
12.30 - 14.00	*Lunch*
14.00 - 15.15	Discussion at Posters
15.15 – 15.30	*Coffee Break*
15.30 – 16.00	Discussion in overall

**Note: Some from the all posters presented and should be within 3 slides*

List of Presentations

No.	Title
L-01	The Impact of Flow Injection on Modern Chemical analysis
L-02	Flow injection solvent extraction for some water monitoring
L-03	Some Flow-Based Analyses for Air Monitoring
L-04	Macronutrient Mapping in Estuarine and Marine Waters by Flow Analysis
P-01	All Injection Analysis: a Simple Technique for Liquid Waste Monitoring
P-02	Flow Injection Analysis of Antioxidant Capacity Based On Scavenging of ABTS Radical Cation
P-03	Determination of Nitrogen Oxides, Sulfur Oxide and Ozone in Ambient Air by Using Portable Flow Analyzer after Collecting with Passive Sampling Devices
P-04	A Continuous-Flow Dialysis System with On-Line Electrothermal Atomic Absorption Spectrometric and pH Measurements for Evaluation of Bioavailability of Minerals
P-05	New Approach for Electrochemical Detection of Iodine in Pharmaceutical Products using the Boron Doped-Diamond Thin Film Electrode
P-06	Flow Injection Analysis of Tetracycline Antibiotics in Pharmaceutical Formulations
P-07	Flow Injection with On-Line UV Photo-Oxidation for Spectrophotometric Determination of Dissolved Reactive Phosphorus (DRP) and Dissolved Organic Phosphorus (DOP) in Natural Water
P-08	A Stopped Flow Injection-Differntial Pulse Voltammetric (sFI-DPV) System for Simultaneous Determination of Chlorate and Chlorite in Agrochemical Samples
P-09	Novel Stopped Flow Injection Iodometry for Determination of Chlorate in Soil
P-10	Micro-Total Analysis System Using the Sequential Injection for Liquid-Liquid Extraction Spectrophotometry

P-11	On-Line Nitrosation Reaction System for the Simultaneous Determination of Nitrite and Nitrate
P-12	A Crushed Barium Sulfate Reactor Column for Sulfate Determination
P-13	Lab-At-Valve (LAV):A Micro Total Analysis System Using Sequential Injection for Determination of Chloride
P-14	An Electrochemical of Chloramphenicol: Comparative Study of Boron-Doped Diamond Thin Film Electrode and Cr(III) Modified Boron-Doped Diamond Thin Film Electrode
P-15	On-Site Determination of Trace Amounts of Formaldehyde in Air by Flow-Injection Technique Coupled with Batchwise Collection Method
P-16	Flow Injection Amperometry for Phosphate Determination in High Salinity Water and On-Line Preconcentration for Low Level Phosphate Water
P-17	Speciation of Trace Amounts of As(III) and As(V) by ICP-AES and On-Line Preconcentration System
P-18	Development of the Flow Microparticle-Based Immunoassay System
P-19	Determination of Protein by Using Bradford Method with Flow Injection System
P-20	Design and Fabrication of Lab on a Chip with the Micro Flow System for Copper(II) Determination
P-21	Development of Micro Reactor for Determining Trace Fe (III) in water by Flow Analysis
P-22	Applications of Flow-Based Techniques in Clinical Analysis
P-23	Flow Injection Analysis of Cefadroxil in Pharmaceutical Preparations with Chemiluminescence Detection
P-24	Flow Injection Determination of Tetracyclines Based on Manganese(II) Enhanced Chemiluminescence Using Ru(bipy)32+ and KMnO4 System
P-25	Dynamic Surface Tension Detector (DSTD) for Flow-Based Analysis
P-26	Flow injection analysis for determination of proparacaine, procaine and tetracaine hydrochloride with chemiluminescence detection

P-27	A micro total analysis system for acid – base microtitration using SI-LOV with air segmentation
P-28	Determination of Some Heavy Metals in Soil Samples by Using an Automated On-Line Solvent Extraction with Flame Atomic Absorption Spectrometry
P-29	Sequential Injection-Column Preconcentration for Iron Determination by Using Flame Atomic Absorption Spectrometry
P-30	Fabrication of a Simple Silver-Silver Chloride Reference Electrode
P-31	Sedimentation Field-Flow Fractionation: Size Characterization of Dairy Products
P-32	GrFFF-ICPMS: An Approach for Size-Based Elemental Speciation
P-33	Analysis of C_{10}-C_{13} Anionic Surfactants Using High Performance Liquid Chromatography and Mass Spectrometry