

Focal Point: Analytical Technology

μ TAS'96

2nd Symposium on Micro Total Analysis Systems

Date and Location

Tuesday, November 19, to Friday, November 22, 1996
Daily from 8.30 to 16.00 h (Friday from 8.30 to 13.00 h)
Convention Center Basel

Key Goals

The aim of the symposium is to expose the State-of-the-Art of research, development and commercialization in the field of μ TAS, and to bring together the research and industrial community interested in this field.

Organized by

H. Michael Widmer (Chairman), Nico De Rooij (Co-Chairman),
K. Heinz Schürch, Peter Denger, Fritz Erni, Jörg Frank,
Marianne Hirschi, Bart van der Schoot, Elisabeth Verpoorte.

Scientific Committee

H. Michael Widmer, Chairman (Switzerland)
Nico De Rooij, Co-Chairman (Switzerland)
Piet Bergveld (The Netherlands)
Fritz Erni (Switzerland)
Jed Harrison (Canada)
Andreas Manz (Great Britain)
Steven Barnard (USA)
Albert van den Berg (The Netherlands)
Bart van der Schoon (Switzerland)

Program

Tuesday, November 19, 1996

08.30 Opening of Symposium and Awards

Plenary Lectures:

08.45–09.30 H.M. Widmer (Ciba-Geigy Ltd., Basel, Switzerland)
'A Survey on the Trends in Analytical Chemistry over the Last 20 Years, Emphasizing the Development of TAS and μ TAS'

09.30–10.15 P. Bergveld et al. (University of Twente, Enschede, The Netherlands)
'Development of μ TAS Concepts at the MESA Research Institute'

10.15–10.50 Coffee break

Parallel Sessions:

	Technology	Fluidics
10.50–11.10	68 Pungor	54 Blankenstein et al.
11.10–11.30	83 Gimzewski et al.	9 Elderstig et al.
11.30–11.50	27 Svasek et al.	11 Nilson et al.
11.50–12.10	89 Foret et al.	55 Zengerle et al.
12.10–13.30	Lunch break	

Poster Session I:

13.30–14.30

Parallel Sessions:

	Bioanalytical Systems	Concepts
14.45–15.10	57 Bin et al.	107 Hinkers et al.
15.10–15.30	30 Laurell et al.	27 Larsen et al.
15.30–15.50	44 Schmitt et al.	50 Maute et al.
15.50–16.30	Coffee break	

Parallel Sessions:

	Bioanalytical Systems	Concepts
16.30–16.50	71 Busch et al.	21 Meckes et al.
16.50–17.10	6 Pelssers et al.	37 Richter et al.
17.10–17.30	56 Cooper et al.	63 Van Steenkiste et al.

Wednesday, November 20, 1996

Plenary Lectures:

08.30–09.15 N.F. De Rooij et al. (University of Neuchâtel, Switzerland)
'Microfabrication Technology for the Construction of μ TAS'

09.30–10.15 A. Okomura et al. (Hitachi Ltd., Tokyo, Japan)
'Integrated Chemical Analysis Systems as a Step Towards Ionoelectronics'

10.15–10.45 Coffee break

10.45–11.30 J.M. Ramsey (Oak Ridge National Laboratory, Tennessee, USA)
'Miniature Chemical Measurement Systems'

11.30–12.15 A. Manz (Imperial College, London, United Kingdom)
'The Secret Behind Electrophoresis Microstructure Design'

12.15–13.30 Lunch break

Poster Session II:

13.30–14.30

Plenary Lectures:

14.45–15.30 D.J. Harrison et al. (University of Alberta, Edmonton, Canada)
'Microchip Lab for Biochemical Analysis'

15.30–16.15 J. Roeraade et al. (Royal Institute of Technology, Stockholm, Sweden)
'Nanochemistry and Nanoseparations of Biomolecules'

16.15–16.45 Coffee break

Oral Presentations, CE and Biochemical Analysis

16.45–17.05 2 A. Ewing
17.05–17.25 59 N.J. Goddard
17.25–17.45 42 D.J. Harrison et al.

Thursday, November 21, 1996

Plenary Lectures:

- 08.30–09.15 *G. Fuhr* (Humboldt-University, Berlin, Germany)
‘Examples of Three-Dimensional Micro-Structures for Handling and Investigation of Adherently Growing Cells and Sub-Micron Particles’
- 09.15–10.00 *M. Albin et al.* (Perkin-Elmer’s Applied Biosystem Division, Foster City, USA)
‘High Density PCR and Beyond’
- 10.00–10.30 Coffee break
- 10.30–11.15 *W. Göpel* (University of Tübingen, Germany)
‘Trends in the Development of Transducers and Detectors for μ TAS’

Oral Presentations, Systems for DNA Analysis:

- 11.15–11.35 60 *R.C. Anderson*
- 11.35–11.55 32 *T.S. Sammarco et al.*
- 11.55–12.15 75 *A. Northrup et al.*
- 12.15–13.30 Lunch break

Poster Session III:

13.30–14.30

Plenary Lecture:

- 14.30–15.00 *M. Ehrat et al.* (Ciba-Geigy Ltd., Basel, Switzerland)
‘Planar Sensor Systems for Trace Analysis of Biomolecules’
- 15.00–15.30 66 *G. Duveneck et al.*
- 15.30–16.00 Coffee break

Oral Presentations, Optical Detection

- 16.00–16.20 65 *A. Bruno et al.*
- 16.20–16.40 48 *K. Hoppe et al.*
- 16.40–17.00 15 *R. Sander et al.*
- 17.10–17.30 85 *K. Swinney et al.*
- 17.30–17.50 13 *B.H. Weigl et al.*
- 19.30 Symposium dinner

Friday, November 22, 1996

Plenary Lectures:

- 09.00–09.45 *E. Smela et al.* (Linköping University of Technology, Sweden)
‘Advances in Conducting Polymer Micro-Machines’
- 09.45–10.30 *S. Shoji et al.* (Waseda University, Tokyo, Japan)
‘Micromachined Micro Flow Devices for a Medical μ TAS’
- 10.30–11.00 Coffee break

Oral Presentations, Miscellaneous:

- 11.00–11.20 05 *J. Shaw et al.*
- 11.20–11.40 72 *F.A.M. Davide et al.*

Plenary Lecture:

- 11.40–12.25 *M. Esashi et al.* (Tohoku University, Sendai, Japan)
‘Bakable Pneumatic Microvalve for Advanced Semiconductor Processing’
- 12.30–13.00 Closing of Symposium

List of Oral Contributions

60. *R.C. Anderson** (Affymetrix, Inc., Santa Clara, USA)
‘Miniaturized Nucleotide Sample Preparation System’
57. *X. Bin**, *B. Danielsson* (Lund University, Sweden)
Simultaneous Determination of Glucose, Lactate, Urea and Penicillin in Mixed Samples ‘Using an Integrated Thermal Biosensor Array’
54. *G. Blankenstein**, *L. Scampavia*, *J. Branebjerg*, *U.D. Larsen* (Technical University of Denmark, Lyngby, Denmark)
‘Flow Switch for Analyte Injection and Cell/Particle Sorting’
65. *A.E. Bruno**, *S. Barnard*, *B. Krattiger*, *M. Ehrat*, *R. Voelkel*, *H.P. Herzig*, *P. Nussbaum*, *R. Dändliker* (Ciba-Geigy, Basel, and University of Neuchâtel, Switzerland)
‘ μ -Optics for μ TAS’
71. *M. Busch**, *J. Schmidt*, *S.A. Rothen*, *C. Leist*, *B. Sonnleitner*, *E. Verpoorte* (Ciba-Geigy, Basel, Switzerland)
‘ μ TAS Meets Biotechnology: Micromachined Flow Systems Combined with Biosensor Arrays for Bioprocess Monitoring’
56. *J.M. Cooper**, *C. Bratten*, *P. Coyle* (University of Glasgow, United Kingdom)
‘Microengineered Sensor Systems for Drug Screening’
72. *F.A.M. Davide**, *C.D. Natale*, *A. D’Amico* (Telecom Italia, Rome, Italy)
‘Dynamics, Adaptation and Control in Chemical Microsystems’
66. *G.L. Duveneck**, *E. Verpoorte*, *P. Oroszlan*, *M. Pawlak*, *C. Erbacher*, *A. Spielmann*, *D. Neuschäfer*, *M. Ehrat* (Ciba-Geigy, Basel, Switzerland)
‘Planar Waveguide Sensing Systems: A Combination of Highly Sensitive Transducers with Smart Fluidic Systems to a True μ TAS’
2. *A. Ewing**, *P.F. Gavin*, *R.A. Clark* (Penn State University, University Park, Pennsylvania, USA)
‘Analytical Systems for Measuring Zeptomole Exocytosis Events from Single Cells’
89. *F. Foret**, *Q. Xue*, *Y. Dunayevskiy*, *B.L. Karger* (Northeastern University, Boston, USA)
‘Microfabricated Device for High Throughput Electrospray/Mass Spectrometry’
83. *J.K. Gimzewski**, *R. Berger*, *C. Gerber* (IBM Research Laboratory, Rüschlikon, Switzerland)
‘Nanometers, Picowatts, Femtojoules: Thermal Analysis and Optical Spectroscopy Using Micromechanics’
59. *N.J. Goddard**, *J.P. Lenny*, *J.C. Morey*, *P.R. Fielden*, *R.D. Snook* (UMIST, Manchester, and Siemens Environmental Systems Ltd., Dorset, United Kingdom)
‘An Electroosmotic Flow System Using Planar Optical Waveguides’
42. *D.J. Harrison**, *P. Li*, *T. Tang* (University of Alberta, Edmonton, Canada)
‘Manipulation of Biological Cells and of DNA On-Chip’

107. *N. Conrath, N. Czupor, H. Frebel, S. Hüwel, K. Köckemann, D. Trau, M. Wittkamp, G. Chemnitz, L. Haalck, H. Hinkers*, M. Meusel, K. Camann, M. Knoll, F. Spener, M. Rospert, R. Kakerow, O. Köster, T. Lerch, W. Mokwa, P. Woias, M. Richter, T. Abel, L. Meixner* (University of Münster, and Fraunhofer-Institutes, Duisburg and Munich, and Technical University Munich, Germany)
'Results of the Development of Sensors and μ TAS-Modules'
9. *J. Holm*, H. Elderstig, O. Kristensen, R. Rigler* (IMC AB, Kista, Sweden)
'A System for Fluorescence Activated Particle Sorting Based on a Quartz Microstructure'
48. *K. Hoppe*, M. Svalgaard, M. Kristensen* (Technical University of Denmark, Lyngby, Denmark)
'Integrated Optical Waveguides in Fluidic Microsystems'
23. *U.D. Larsen*, G. Blankenstein, J. Branebjerg* (Technical University Denmark, Lyngby, Denmark)
'A Novel Principle in Construction of Chemical and Biochemical Liquid Analysis Systems'
30. *T. Laurell*, J. Drott, L. Rosengreen* (Lund Institute of Technology, Lund, Sweden)
'Catalytic Increase in Micro Flow Through Bioreactors Using Porous Silicon as a Surface Enlarging Matrix'
50. *A. Maute*, G. Rozing, A. Wiese* (Hewlett-Packard, Waldbronn, Germany)
'Liquid Phase Analytical Instrumentation and Microsystems Technology: A Few Examples'
21. *A. Meckes*, J. Behrens, M. Hauser, W. Benecke, M. Gebhard* (University of Bremen, Bremen, Germany)
'Concept and Design Considerations for a Miniaturized Gas Analyzer'
11. *J. Nilsson*, T. Laurell, L. Wallman, J. Drott* (Lund Institute of Technology, Lund, Sweden)
'A Flow-Through Liquid Picoliter Sampling Cell'
75. *M.A. Northrup*, B. Beeman, D. Hadley, P. Landre, S. Lehew* (Lawrence Livermore Laboratory, Livermore, California, USA)
'Integrated Miniature DNA-Based Analytical Instrumentation'
6. *E. Pelssers*, H. van Damme, W. Carpay* (The Netherlands)
'Fluid Elements: A Concept for Automation and Miniaturization'
68. *E. Pungor*, I. Slezsák* (Zoltan Bay Foundation, Budapest, Hungary)
'Application Facilities of the Oscillometric Technique in the Industrial Laboratories'
37. *M. Richter*, A. Prak, J. Naundorf, M. Eberl, H. Leeuwis, P. Woias, A. Steckenborn* (Fraunhofer Institute, Munich, Germany)
'Development of a Micro-Fluid System as a Demonstrator for a μ TAS'
32. *T.S. Sammarco*, Y.D. Fields, B.N. Johnson, D.K. Jones, D.T. Burke, C.H. Mastrangelo, M.A. Burns* (University of Michigan, Ann Arbor, Michigan, USA)
'Microfabrication of an Integrated DNA Analysis System'
15. *R. Sander*, O. Blume, J. Müller* (Technical University Hamburg-Harburg, Hamburg, Germany)
'Microspectrometer for VIS Photometry'
44. *H.-M. Schmitt*, A. Brecht, G. Gauglitz* (Eberhard-Karls-University, Tübingen, Germany)
'An Integrated System for Microscale Affinity Measurements'
5. *J. Shaw*, B. Miller, C. Turner, M. Harper, S. Graham* (Thorn Emi Crl, Hayes, United Kingdom)
'Mass Transfer of Species in Micro-Contactors: CFD Modelling and Experimental Validation'
27. *P. Svasek*, G. Jobst, G. Urban, E. Svasek* (Technical University of Vienna, Austria)
'Dry Film Resist Based Fluid Handling Components for μ TAS'
85. *K. Swinney*, N. Steinmetz, C.K. Kenmore, J. Hankins, D.J. Bornhop* (Texas Tech University, Lubbock, Texas, USA)
'Interferometric Backscatter for Polarimetric and Refractive Index Detection in Ultra-Microvolumes'
63. *F. van Steenkiste*, H. Grünkorn, L. Claesen, K. Baert, L. Hermans, D. Debruyker, M. De Cooman, V. Spiering, A. van den Berg, B. van der Schoot, P. Arquint, R. Born, K. Schumann* (IMEC, Leuven, Belgium)
'A Microsensor Array for Biochemical Sensing'
13. *B.H. Weigl*, M.R. Holl, D. Schutte, J.P. Brody, P. Yager* (University of Washington, Seattle, Washington, USA)
'Diffusion-Based Optical Chemical Detection in Silicon Flow Structures'
55. *R. Zengerle*, M. Stehr, M. Freygang, H. Haffner, S. Messner, R. Rossberg, H. Sandmaier* (Fraunhofer Institute, Munich, Germany)
'Microfabricated Devices and Systems for Handling of Liquids and Gases'

List of Posters

22. *J. Behrens*, A. Meckes, M. Gebhard, W. Benecke* (Germany)
'Novel Electromagnetic Microactuator with a Backside Positioned Permanent Magnet'
45. *A. Brecht*, M. Rothmund, M. Steinwand, G. Gauglitz* (Germany)
'Parallel Sample Analysis in Miniaturized Affinity-Based Systems'
3. *R.A. Clark*, A.G. Ewing* (USA)
'Picoliter Microvials for Single Cell Analysis'
29. *S. Cowen*, D.H. Craston* (United Kingdom)
'Initial Stages in the Development of a Miniature Integrated Liquid Analysis System'
10. *A. Drapp*, G. Gauglitz, R. Gottfried-Gottfried* (Germany)
'Integrated Optical Mach-Zehnder Devices for the Sensing of Halogenated Hydrocarbons and Ammonia'
101. *S. Drost*, H. Hinkers, W. Wörmann, P. Woias, G. Resch, T. Abel, L. Meixner* (Germany)

- 'Microanalytical Systems for Environmental Control: Aims, Specifications and Structures of μ TAS-Modules'
82. J.A. Dzubian*, A. Górecka-Drazga, L. Nieradko, J. Mróz (Poland)
'Silicon Microcolumns for Integrated Gas Chromatography'
40. C.S. Effenhauser*, I. Barmé, G.J.M. Bruin, A. Paulus (Switzerland)
'New Materials and Simplified Fabrication Processes for Planar Integrated Capillary Electrophoresis on Micromachined Chips'
79. R.J.M. Egberink*, R.J.W. Lugtenberg, J.F.J. Engbersen, D.N. Reinhoudt (The Netherlands)
'The Application of Polysiloxane-Based CHEMFETs for μ TAS at Higher Pressure'
104. R. Ferretti*, F. Schitthelm, N. Czupor, H. Hinkers, C. Sundermeier, W. Konz, M. Rospert (Germany)
'Amperometric, Potentiometric and Optical Transducers Realized in the VIMAS/MIBIC Projects'
90. Y. Fitschenko*, G.S. Wilson (USA)
'The Analysis of Glucose and a Herbicide by Micro-Flow Injection Analysis'
41. K. Fluri*, X. Qiu, D.J. Harrison (Canada)
'The Effect of Valveless Microfluidic Systems on Post-Column Reactions and Separation Efficiency'
33. A. Götz*, C. Cané, I. Gràcia, E.L. Tamayo (Spain)
'A Sensor Chip for Biomedical Analysis'
35. M.-A. Grétilat*, F. Paoletti, P. Thiébaud, S. Roth, M. Koudelka-Hep, N.F. de Rooij (Switzerland)
'A New Fabrication Method of Borosilicate Glass Capillary Tubes with Lateral Inlets and Outlets'
20. O. Guenat*, P. Arquint, I. Weber, W.E. Morf, B.H. van der Schoot, N.F. de Rooij (Switzerland)
'Micro Total Analysis Systems for Nano Titrations of Analytes'
17. T. Hofmann*, F. Beckmann, S. Michaelis, J. Zacheja, J. Binder (Germany)
'Miniaturized Flexible-Fuel Sensor'
53. M.P. Houlne, D.S. Hubbard, D. Bornhop* (USA)
'Spectroscopic Imaging of Tissues for Early Disease Identification and Fluid Transport Investigation Using a Micro-Endoscopy'
52. S.C. Jacobson*, J.M. Ramsey (USA)
'Rapid, High Sensitivity Analysis with Microchip Electrophoresis'
25. G. Jobst*, I. Moser, P. Svasek, E. Svasek, M. Varahram, G. Urban (Austria)
'Rapid Liver Enzyme Assay with Low Cost Micro-TAS'
74. S. Kluge*, P. Woias, R. Paneva, T. Hermes, G. Temmel (Germany)
'A Micro Fluid System for Liquid Dosage and Nebulization'
69. V.I. Konov*, T.V. Tulaikova, A.L. Popov (Russia)
'Sensor Sensitive Element Using Micromechanical Vibrations of Optical Fiber, Optimal Excitation'
19. W. Konz* (Germany)
'Micro Absorption Measuring Cell for Water Analysis'
91. V. Kurkov, V. Smyntyna* (Ukraine)
'The Production of Thin Film Gas Sensors by Electrospray Pyrolysis Technology'
24. U.D. Larsen*, J. Branebjerg, G. Blankenstein (Denmark)
'Fast Mixing by Parallel Multilayer Lamination'
39. A. Leidl*, A. Bruhn, E. Yacoub-George, S. Drost (Germany)
'SAW-Device as Direct Immunosensor'
49. B. Lendl*, L. Küpper, R. Kellner (Austria)
'Novel Miniaturized IR-Lens and Fibre-Optic Based FTIR-Detector for Molecular Specific Analysis in Total Analysis Systems'
73. M. Maruo*, E. Nakayama, K. Kamiyama, T. Kimoto (Japan)
'Application of High Resolution Micro Flow Analysis to *in situ* Ammonium Ion Profiles in Ice Core'
81. J. Metze*, G. Gastrock, S. Howitz, T. Wegener, M. Bürger (Germany)
'Utilization of Microsystem – Parts in Sampling System of Bioreactor'
105. M. Meusel*, B. Ross, M. Richter, P. Woias, T. Abel, L. Meixner, O. Köster, M. Rospert, R. Ferretti (Germany)
'Chemically and Biochemically Modified Microsensors for the Detection of Herbicides, Nitrate and Ortho Phosphate'
26. I. Moser*, G. Jobst, P. Svasek, M. Varahram, G. Urban (Austria)
'On-Line Monitoring of Glucose, Lactate, Glutamine, and Glutamate with Integrated Micro Biosensor Array'
76. H. Nakanishi*, T. Nishimoto, T. Nakamura, S. Nagamachi (Japan)
'Micromachined Quartz and Pyrex Chips for Capillary Electrophoresis'
16. R. Rapp*, W. Hoffmann, H.J. Ache (Germany)
'Performance of a Modular μ TAS with Electrochemical Detection'
38. M. Richter*, P. Woias, U. Schaber, T. Lohr (Germany)
'A Silicon Micro Valve with Defined Threshold Pressure'
34. Z. Sbiaa*, A. Val, S. Aouba, H. Camon, D. Esteve (France)
'3D Integrated Micropump and Microvalves for a Micro Total Analysing System'
87. M. Schildenberger*, Y. Bonetti, M. Aeschlimann, L. Scandella, J. Gobrecht, R. Prins (Switzerland)
'Micro-Fabricated Model Catalysts as Advanced Tools for Investigating Catalytic Surface Reactions'
78. W.K. Schomburg*, R. Ahrens, W. Bacher, B. Büstgens, C. Goll, J. Martin (Germany)
'Polymer Active Microfluidic Devices for μ TAS'

88. *J. Shaw**, *C. Turner* (United Kingdom)
'Visualisation, Modelling and Optical Measurements in Micro-Engineered Systems'

80. *R.W. Tjerckstra**, *J.G.E. Gardeniers*, *A. Van den Berg*, *M.C. Elwenspoek* (The Netherlands)
'Isotropically Etched Channels for Gas Chromatography'

12. *H. Uchida**, *W. Zhang*, *H. Maekawa*, *T. Katsube* (Japan)
'SPV Chemical Image Sensing System Using SOI Substrate'

58. *E.B. Van Akker**, *M. Bos*, *A. van den Berg*, *W.E. van der Linden* (The Netherlands)
'Simulation (and Experimental Verification) of Different Parts of a μ -Flow Injection Analysis-System'

77. *P. Van Gerwen**, *G. Huyberechts*, *M. Op de Beeck*, *K. Baert*, *A. Varlan*, *W. Sansen*, *L. Hermans*, *R. Mertens* (Belgium)
'Nanoscaled Interdigitated Electrodes for Biochemical Sensors'

62. *K. Verhaegen**, *A. Verbist*, *A. De Caussemaecker*, *K. Baert* (Belgium)
'A High Throughput Microfysiometer'

14. *B.H. Weigl**, *M.C. Huang*, *G. van den Engh*, *R. Kaiser*, *E. Altendorf*, *M. Afromowitz*, *P. Yager* (USA)
'Fluorescent Reporter Beads for Chemical Analysis'

36. *P. Woias**, *M. Richter*, *E. Yacoub-George*, *H. Wolf*, *T. Abel* (Germany)

'A Micromachined Open Tubular Reactor for Heterogeneous Immunoassays'

103. *P. Woias**, *M. Richter*, *S. Kluge*, *T. Abel* (Germany)
'Micropumps and Microfluid Components for μ TAS Applications'

7. *B. Wolf** (Germany)
'The Physiocontrol-System: Development and Characterization of Cellular Biosensors'

84. *M. Wörner**, *G. Heit*, *T.M. Hashem*, *S.H. Bossmann*, *A.M. Braun* (Germany)
'Electrochemical Devices for the Environmental Analysis. A Miniaturized Flow-Through Accessory for the Degradation of Organic Matter in Aqueous Systems'

47. *O.A. Zaporozhets**, *O.Yu. Nadzhafova*, *N.A. Lipkovska*, *V.V. Sukhan* (Ukraine)
'New Miniaturized Chemical Sensor Devices for Test and Flow Injection Water Quality Control'

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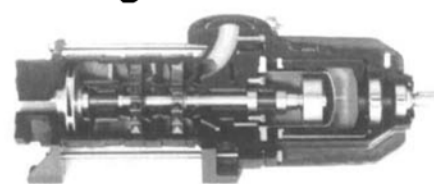
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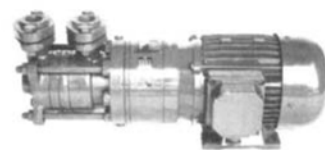
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