

Model 3980C  
macroIMS™  
Macroion Mobility Spectrometer  
Bibliography

This bibliography lists selected publications relating to TSI's Model 3980C *macroIMS* system. The *macroIMS* technology uses a form of charge-reduced electrospray ionization or nanospray, in combination with ion mobility analysis using a Differential Mobility Analyzer (DMA). Related terms and acronyms found in the literature are IMS (ion mobility spectrometry), EM (electrical or electrophoretic mobility), SMPS (scanning mobility particle sizer), and GEMMA (TSI's gas-phase electrophoretic mobility macromolecule analyzer, the predecessor of *macroIMS*).

**2005**

"Electrospray Ionization Mass Spectrometry and Ion Mobility Analysis of the 20S Proteasome Complex," Loo JA, Berhane B, Kaddis CS, Wooding KM, Xie, Y, Kaufman SL, Chernushevich IV, *J. Am. Soc. Mass Spectrom.*, 2005, **16**, 998-1008.

**2004**

"Electrospray Ion Mobility Spectrometry of Intact Viruses," Thomas JJ, Bothner B, Traina J, Benner WH, Siuzdak G, *Spectroscopy*, 2004, **18**, 31-36.

"Mass analysis of water-soluble polymers by mobility measurement of charge-reduced ions generated by electrosprays," Saucy DA, Ude S, Lenggoro IW, de la Mora JF, *Anal. Chem.*, 2004, **76**, 1045-1053.

"Mass distribution measurement of water-insoluble polymers by charge-reduced electrospray mobility analysis," Ku BK, de la Mora JF, Saucy DA, Alexander, JN, *Anal. Chem.*, 2004, **76**, 814-822.

**2003**

"Analysis of Large Supramolecular Protein Complexes by Mass Spectrometry and Gas-Phase Mobility," Loo JA, Kaufman SL, Chernushevich I. Presented at *American Society for Mass Spectrometry, Annual Meeting*, Montreal. 2003.

"Ion mobility analysis of biological particles," Benner WH, Krauss RM, Blanche PJ, US Patent Application, 20030136680, 2003.



## 2002

“Quantitative Protein Characterization with Gas-Phase Electromobility,” Shang TQ, Johnston MV, *Proc. 50th ASMS Conference on Mass Spectrometry and Allied Topics*, Orlando, FL. 2002.

“Sizing of colloidal nanoparticles by electrospray and differential mobility analyzer methods,” Lenggoro IW, Xia B, Okuyama K, de la Mora JF, *Langmuir*, 2002, **18**, 4584-4591.

## 2001

“Gas-Phase Electrophoretic Molecular Mobility Analysis at Atmospheric Pressure of High Mass Hetero- and Homo-Noncovalent Biocomplexes in Comparison with UV MALDI MS Analysis,” Allmaier G, Bacher G, Zehl M, Sutton C, Kaufman S, Szymanski WW, *Proc. 49th ASMS Conference on Mass Spectrometry and Allied Topics*, Chicago, IL., 2001.

“Gas-Phase Electrophoretic Molecular Mobility Analysis at Atmospheric Pressure of High Mass Hetero- and Homo-Noncovalent Biocomplexes in Comparison with UV MALDI MS Analysis,” Allmaier G, Bacher G, Zehl M, Sutton C, Kaufman S, Szymanski WW, *Proc. 49th ASMS Conference on Mass Spectrometry and Allied Topics*, Chicago, IL., 2001.

“Charge-Reduced Nano Electrospray Ionization Combined with Differential Mobility Analysis of Peptides, Proteins, Glycoproteins, Noncovalent Protein Complexes and Viruses,” Bacher G, Szymanski WW, Kaufman SL, Zoellner P, Blaas D, Allmaier G, *J. Mass Spectrom.*, 2001, **36**(9), 1038-1052.

“Investigating Intact Viruses with Charge-Detection MS and Ion Mobility,” Benner WH, Hack CA, Traina JA, *Proc. 49th ASMS Conference on Mass Spectrometry and Allied Topics*, Chicago, IL. 2001.

## 2000

“Electrospray Diagnostics Performed by using Sucrose and Proteins in the Gas-Phase Electrophoretic Mobility Molecular Analyzer (GEMMA),” Kaufman SL, *Anal. Chim. Acta*, 2000, **406**, 3-10.

## 1999

“Charge-Reduced ESI with Differential Mobility Analysis of Biopolymers and Non-covalent Complexes,” Allmaier G, Bacher G, Kaufman S, Szymanski WW, *Proc. 47th ASMS Conference*, Dallas, TX, p348. 1999.

“Molecular Mass Determination of Noncovalent Complexes and Biopolymers—Proteins and Carbohydrates—by Applying a Gas Phase Electrophoretic Mobility Mass Analyzer,” Allmaier G, Bacher G, Kaufman S, Szymanski WW, *J. Aerosol Sci.*, 1999, **30**, Suppl. 1, S303-S304.

“Nucleotide Exchange in Genomic DNA of Rat Hepatocytes using RNA/DNA Oligonucleotides,” Bandyopadhyay P, Ma Xiaoming, Linehan-Stieers, C, Kren BT, Steer CJ, *J. Biological Chemistry*, 1999, **274**(15), 10163-10172.

“Conversion Efficiency of the TSI Model 3480 Electrospray Aerosol Generator using Sucrose,” Kaufman SL, Caldow R, Dorman FD, Irwin KD, Pöcher A, *J. Aerosol Sci.*, 1999, **30**, Suppl. 1, S373.

“Design of a Nanometer Electrospray Aerosol Generator,” Kaufman SL, Caldow R, Dorman FD, Irwin KD, Pöcher A, *J. Aerosol Sci.*, 1999, **30**, Suppl. 1, S695.

“Nanoparticle Detection Methods for Chemical Analysis,” Koropchak JA, Sadain S, Yang X, Magnusson LE, Heybroek M, Anisimov M, Kaufman SL, *Anal. Chem.*, 1999, **4**, 386A.\*

“Controlling Charge States of Large Ions,” Scalf M, Westphall MS, Krause J, Kaufman SL, Smith LM, *Science*, 1999, **283**, 194-197.

“Characterization of Purified MS2 Bacteriophage by the Physical Counting Methodology Used in the Integrated Virus Detection System (IVDS),” Wick CH, McCubbin PE, *Tox. Meth.*, 1999, **9**, 245-252.

“Purification of MS2 Bacteriophage from Complex Growth Media and Resulting Analysis by the Integrated Virus Detection System (IVDS),” Wick CH, McCubbin PE, *Tox. Meth.*, 1999, **9**, 253-263.

“Passage of MS2 Bacteriophage through Various Molecular Weight Filters,” Wick CH, McCubbin PE, *Tox. Meth.*, 1999, **9**, 265-273.

## 1998

“Analysis of a 3.6 MDa Hexagonal Bilayer Hemoglobin from *Lumbricus Terrestris* using an Electrospray Gas Phase Electrophoretic Mobility Molecular Analyzer,” Kaufman SL, Kuchumov AR, Kazakevich M, Vinogradov SN, *Anal. Biochem.*, 1998, **259**, 195-202.

“Analysis of Biomolecules using Electrospray and Nanoparticle Methods: The Gas-Phase Electrophoretic Mobility Molecular Analyzer (GEMMA),” Kaufman SL, *J. Aerosol Sci.*, 1998, **29**, 537.\*

“Capillary Reverse Phase HPLC with Electrospray Condensation Particle Counting Detection,” Lewis KC, Jorgenson JW, Kaufman SL, Skogen JW, *J. Microcol. Separations*, 1998, **10**(6), 467-471.

“Differential mobility analysis of molecular ions and nanometer particles,” de la Mora JF, Eichler T, Rosell J, *TRAC – Trends in Analytical Chemistry*, 1998, **17**, 328-339.

## 1997

“GEMMA (Gas Phase Electrophoretic Mobility Molecular Analyzer)—A Tool for the Study of Biopolymers and Non-covalent Biocomplexes in Combination with Separation Techniques,” Allmaier G, Kaufman S, Linnemayr KI, Szymanski WW, Presented at 17<sup>th</sup> International Symposium on the Separation of Proteins, Peptides, and Polynucleotides (ISPPP97), Rockville, MD. 1997.

“Size Determination of an Oligonucleotide by Gas-Phase Electrophoretic Mobility Molecular Analysis or GEMMA,” Bandyopadhyay P, Kaufman SL, Kren BT, Steer C J, Presented at American Association of Pharmaceutical Scientists Annual Meeting, Boston. 1997.

“Experimental Investigation of Scaling Laws for Electrospraying: Dielectric Constant Effect,” Chen D-R, Pui, DYH, *Aerosol Sci. Technol.* 1997, **27**, 367-380.

“Sugar-Coated Macromolecules Generated by Electrospray,” Kaufman SL, Contributed paper presented at 16th Annual Conference, American Assoc. for Aerosol Research, Denver, CO. 1997.

“DNA Analysis using an Electrospray Scanning Mobility Particle Sizer,” Mouradian S, Skogen JW, Dorman FD, Zarrin F, Kaufman SL, Smith LM, *Anal. Chem.*, 1997, **69**, 919-925.

“Comparison of Molecular Mass Data of Biomolecules Obtained by GEMMA and MALDI-TOF-MS,” Szymanski WW, Kaufman SL, Linnemayr K, Allmaier G, Presented at European Aerosol Conference, Hamburg. 1997.

## 1996

“Macromolecule Analysis Based on Electrophoretic Mobility in Air: Globular Proteins,” Kaufman SL, Skogen JW, Dorman FD, Zarrin F, Lewis KC, *Anal. Chem.*, 1996, **68**, 1895-1904.\*

“Correction: Macromolecule Analysis Based on Electrophoretic Mobility in Air: Globular Proteins,” Kaufman SL, Skogen JW, Dorman FD, Zarrin F, Lewis KC, *Anal. Chem.*, 1996a, **68**, 3073.

“Capillary Zone Electrophoresis with Electrospray Condensation Particle Counting Detection,” Lewis KC, Jorgenson JW, Kaufman SL, *J. Capillary Electrophoresis*, 1996, **3**, 229.

## 1995

“Electrospraying of Conducting Liquids for Monodisperse Aerosol Generation in the 4 nm to 1.8  $\mu\text{m}$  Diameter Range,” Chen D-R, Pui DYH, Kaufman SL, *J. Aerosol Sci.*, **1995**, 26, 963-977.\*

“Aerosol Methods for Biological Macromolecule Detection and Analysis,” Kaufman SL, Paper 122, U.S. Army ERDEC *Scientific Conference on Chemical and Biological Defense Research*, Aberdeen Proving Ground, MD. 1995.

## 1994

“Monodisperse Nanometer Aerosol Generation Using an Electrospraying Technique,” Chen D-R, Pui DYH, Kolstad K, Kaufman SL, Dorman FD, *Abstracts, Fourth International Aerosol Conference*, Aug 29–Sep 2, 1994, ed. Flagan, R. C., **515**. 1994.

“Electrospray-Condensation Particle Counter: A Molecule-Counting LC Detector for Macromolecules,” Lewis KC, Dohmeier DM, Jorgenson JW, Kaufman SL, Zarrin F, Dorman FD, *Anal. Chem.*, 1994, **66**, 2285.

## 1993

“Electrospray Apparatus for Producing Uniform Submicrometer Droplets,” Kaufman SL, Zarrin F, Dorman F, *U. S. Patent No. 5,247,842*. 1993.

## 1991

“Droplet Size Measurements of Various Nebulizers using Differential Electrical Mobility Particle Sizer,” Zarrin F, Kaufman SL, Socha JR, *J. Aerosol Sci.*, 1991. **22**, S343-S346.

“Method and Apparatus for Determining Concentration of Macromolecules and Colloids in a Liquid Sample,” Zarrin F, Kaufman SL, Dorman F, *U. S. Patent No. 5,076,097*. 1991a.

---

\* papers with useful introductory or summary information

---

TSI Incorporated – 500 Cardigan Road, Shoreview, MN 55126 U.S.A

USA	Tel: +1 800 874 2811	E-mail: <a href="mailto:info@tsi.com">info@tsi.com</a>	Website: <a href="http://www.tsi.com">www.tsi.com</a>
UK	Tel: +44 149 4 459200	E-mail: <a href="mailto:tsiuk@tsi.com">tsiuk@tsi.com</a>	Website: <a href="http://www.tsiinc.co.uk">www.tsiinc.co.uk</a>
France	Tel: +33 491 11 87 64	E-mail: <a href="mailto:tsifrance@tsi.com">tsifrance@tsi.com</a>	Website: <a href="http://www.tsiinc.fr">www.tsiinc.fr</a>
Germany	Tel: +49 241 523030	E-mail: <a href="mailto:tsigmbh@tsi.com">tsigmbh@tsi.com</a>	Website: <a href="http://www.tsiinc.de">www.tsiinc.de</a>
India	Tel: +91 80 41132470	E-mail: <a href="mailto:tsi-india@tsi.com">tsi-india@tsi.com</a>	
China	Tel: +86 10 8251 6588	E-mail: <a href="mailto:tsibeijing@tsi.com">tsibeijing@tsi.com</a>	
Singapore	Tel: +65 6595 6388	E-mail: <a href="mailto:tsi-singapore@tsi.com">tsi-singapore@tsi.com</a>	



TRUST. SCIENCE. INNOVATION.

Contact your local TSI Distributor or visit our website [www.tsi.com](http://www.tsi.com) for more detailed specifications.