

**Process Measurements Division
Outputs and Interactions, FY04**

1. Publications

- Abbott, P.J., Looney, J.P., and Mohan, P., "*The Effect of Ambient Temperature on the Sensitivity of Hot-Cathode Ionization Gauges*," Vacuum (in press).
- Balss, K.M., Ross, D.J., and Tarlov, M.J., "*Temperature Gradient Focusing of Matched and Partially Mismatched DNA/PNA Hybridizations*," Proc. 7th Intl. Conf. on Miniaturized Chemical and Biochemical Analysis Systems 2003 (in press).
- Balss, K.M., Ross, D.J., Begley, H., Olsen, K.G., and Tarlov, M.J., "*Controlled Mixing: An In-Situ Hybridization Assay of Peptide Nucleic Acids with DNA by Temperature Gradient Focusing*," J. of American Chemical Society 126, p. 13474-13479 (2004).
- Balss, K.M., Howell, P.B., and Ross, D.J., "*Micellar Affinity Gradient Focusing*," J. of American Chemical Society 126, p. 1936-1937 (2004).
- Balss, K.M., Vreeland, W.N., Phinney, K.W., and Ross, D.J., "*Chiral Temperature Gradient Focusing*," Science (in press).
- Benkstein, K.D., and Semancik, S., "*Mesoporous Nanoparticle TiO₂ Thin Films for Conductometric Gas Sensing on Microhotplate Platforms*," Sensors & Actuators B: Chemical (in press).
- Berg, R.F., and Tison, S.A., "*Two Primary Standards for Low Flows of Gases*," J. of Research of the National Institute of Standards and Technology (in press).
- Berg, R.F., "*Fluids Near a Critical Point Obey the Cox-Merz Rule*," J. of Rheology (in press).
- Berg, R.F., "*Quartz Capillary Flow Meter for Gases*," Rev. of Scientific Instruments 75, p. 772-779 (2004).
- Bertram, T.H., Cohen, R.C., Thorn, W.J., and Chu, P.M., "*Measurement Consistency of Ozone and Oxides of Nitrogen Standards at Tropospheric Relevant Mixing Ratios*," J. of Air and Waste Management (in press).
- Boger, Z., Meier, D.C., Cavicchi, R.E. and Semancik, S., "*Rapid Identification of CW Agents by Artificial Neural Networks Pruning of Temperature Programmed Microsensor Databases*," Sensor Letters 1 (1), p. 86-92 (2003).
- Bousquet, R.R., Chu, P.M., DaBell, R.S., Grabow, J.U., and Suenram, R.D. "*Trends in Microwave Spectroscopy for the Detection of Chemical Agents*," IEEE Sensors Journal (in press).

- Cavicchi, R.E., Semancik, S., DiMeo, F., and Taylor, C.J., ***“Use of Microhotplates in the Controlled Growth and Characterization of Metal Oxides for Chemical Sensing,”*** J. of Electroceramics 9 (3), p. 155-164 (2003).
- Cavicchi, R.E., Poirier, G.E., Tea, N.H., Afridi, M., Berning, D.W., Hefner, A.R., Suehle, J.S., Gaitan, M., Semancik, S. and Montgomery, C.B., ***“Micro-Differential Scanning Calorimeter for Combustible Gas Sensing,”*** Sensors and Actuators B 97, p. 22-30 (2004).
- Chen, D.H., DeWitt, D.P, Tsai, B.K., Kreider, K.G., and Kimes, W.A., ***“Effects of Wafer Emissivity on Rapid Thermal Processing Temperature Measurement,”*** Temperature: Its Measurement and Control In Science and Industry, Vol. 7, Proc. AIP Conf. 684, pp. 1087-1092 (2003).
- Dable, B.K., Cavicchi, R.E., and Semancik, S., ***“Calibration of Microhotplate Conductometric Gas Sensors by Non-Linear Multivariate Regression Methods,”*** Sensors & Actuators B 101, p. 284-294 (2004).
- Ehrlich, C.D., and Schmidt, J.W., ***“IUPAC Experimental Thermodynamics Volume VI: Measurement of the Thermodynamic Properties of Single Phases: Chap. 3 Pressure; b) Piston Gauges,”*** Experimental Thermodynamics Intl. Union of Pure and Applied Chemistry (in press).
- Evju, J.K., Howell, P.B., Locascio, L.E., Tarlov, M.J., and Hickman, J.J., ***“Atmospheric Pressure Microplasmas for Modifying Sealed Microfluidic Devices,”*** Applied Physics Letters 84, p. 1668-1670 (2004).
- Fellmuth, B., Berger, D., Wolber, L., deGroot, M., Head, D., Hermier, Y., Mao, Y. Z., Nakano, T., Pavese, F., Shkraba, V., Steele, A.G., Steur, P.P.M., Szymrka-Grzebyk, A., Tew, W.L., Wang, L., and White, D.R., ***“An International Star Intercomparison of Low-Temperature Fixed Points Using Sealed Triple-Point Cells,”*** Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 885-890 (2003).
- Gillis, K.A., Shinder, I., and Moldover, M.R., ***“Thermoacoustic Boundary Layers Near the Liquid-Vapor Critical Point,”*** Phys. Rev. Let. E (70), p. 021201-01 - 021201-20 (2004).
- Hacker, C.A., Batteas, J.D., Garno, J.C., Marquez, M., Richter, C.A., Richter, L.J., van Zee, R.D., and Zangmeister, C.D., ***“Structural and Chemical Characterization of Monofluoro-Substituted Oligo (phenylene-ethynylene) Thiolate Self-Assembled Monolayers on Gold,”*** Langmuir 20, p. 6195-6205 (2004).
- Hernandez, R.M., Semancik, S., Richter, L.J., and Mallouk, T. E., ***“Fabrication and Characterization of Protein Functionalized Gold-poly (pyrrole) – Gold Nanowires,”*** Chemistry of Materials 16, p. 3431-3438 (2004).

- Hodes, M., Griffith, P., Smith, K.A., Hurst, W.A., Bowers, W.J., and Sako, K., "***Salt Solubility and Deposition in High Temperature and Pressure Aqueous Solutions,***" American Inst. of Chemical Engineers 50 (9), p. 2038-2049 (2004).
- Hodges, J.T., Layer, H.P., Miller, W.W., and Scace, G.E., "***Frequency-Stabilized Single-Mode Cavity Ring-Down Apparatus for High-Resolution Absorption Spectroscopy,***" Review of Scientific Instruments 75, p.849-863 (2004).
- Hodges, J.T., "***High-Resolution Cavity Ring-Down Spectroscopy of $H_2^{16}O$ at 10687.36 cm^{-1} ,***" Proc. OSA Conf. on Advanced Solid-State Lasers, (on CD) (2004).
- Hodges, J.T., Dheandhanoo, S., Vorsa, V., Ketkar, S., "***Quantitative Absorption Spectroscopy of Residual H_2O in High Purity Gases: Pressure-Broadening of the 1.392543 nm Transition by N_2 , He , HBr and $C12$,***" Applied Optics (in press).
- Hodges, J.T., and Scace, G.E., "***Advanced Humidity Standards Address New Demands for Measurements of Trace Water Vapor in Specialty Gases,***" Semiconductor Intl. (in press).
- Huang, P.H., and Harvey, A.H., "***A Critical Review of Second Virial Coefficients for Water Vapor with Air and with Argon,***" Proc. TEMPMEKO 2004 (in press).
- Huang, P.H. and Margolis, S., "***Water Determination: Physical and Chemical Methods,***" Encyclopedia of Analytical Science, 2nd Ed., Elsevier, London, England (in press).
- Hurly, J.J., "***Thermodynamic Properties of Gaseous Nitrous Oxide and Nitric Oxide from Speed-of-Sound Measurements,***" Intl. J. of Thermophysics 24, p. 1611-1635 (2003).
- Hurly, J.J., Gillis K.A., Mehl, J.B., and Moldover, M.R. "***The Viscosity of Seven Gases Measured with a Greenspan Viscometer,***" Intl. J. of Thermophysics 24 (6), p. 1441-1474 (2003).
- Jain, K., Bowers, W.J., and Schmidt, J.W., "***A Primary Dead-Weight Tester for Pressures (0.05-1.0) MPa in Gage Mode,***" Proc. IMEKO (in press).
- Johnson, A.N., Wright, J.D., Moldover, M.R., and Espina, P.J., "***Temperature Characterization in the Collection Tank of the NIST 26 m³ PVT Gas Flow Standard,***" Metrologia 40, p. 211-216 (2003).
- Johnson, A.N., and Kegel, T., "***Uncertainty and Traceability for the CEESI Iowa Natural Gas Facility,***" J. of Research of the National Institute of Standards & Technology, p. 345-369 (2004).
- Johnson, A.N., Merkle, C.L., Moldover, M.R., and Wright, J.D., "***Relaxation Effects in Small Critical Nozzles,***" J. of Fluids Engineering (in press).

- Kimura-Suda, H., Petrovykh, D.Y., Tarlov, M.J., and Whitman, L.J., "**Base-Dependent Competitive Adsorption of Single-Stranded DNA on Gold**," J. American Chemical Society 125, p. 9014-9015 (2003).
- Kreider, K.G., Kimes, W.A., Meyer, C.W., Ripple, D.C., Tsai, B.K., Chen, D.H., and DeWitt, D.P., "**Calibration of Radiation Thermometers in Rapid Thermal Processing Tools using Si Wafers with Thin Film Thermocouples**," Temperature: Its Measurement and Control in Science and Technology, Vol. 7, Proc. AIP Conf. 684, p. 1087-1092 (2003).
- Kreider, K.G., Chen, D.H., DeWitt, D.P., Kimes, W.A., and Tsai, B.K., "**Effects of Lightpipe Proximity on Si Wafer Temperature in Rapid Thermal Processing Tools**," Proc. AIP Conf. on Characterization and Metrology for ULSI Technology, p. 200-204 (2003).
- Kreider, K.G., Chen, D.H., DeWitt, D.P., Kimes, W.A., and Tsai, B.K., "**Lightpipe Proximity Effects on Si Wafer Temperature in Rapid Thermal Processing Tools**," Proc. 11th IEEE International Conf. on Thermal Processing of Semiconductors - RTP 2003, p. 125-129 (2003).
- Kreider, K.G., DeWitt, D.P., Fowler, J.B., Proctor, J.E., Kimes, W.A., Ripple, D.C., and Tsai, B.K., "**Comparing the Transient Response of a Resistive-Type Sensor with a Thin-Film Thermocouple during the Post-Exposure Bake Process**," Proc. SPIE 29th Intl. Symp. on Microlithography (in press).
- Kremer, D.M., Davis, R.W., Moore, E.F., and Ehrman, S.H., "**A Numerical Investigation of Aerosol Dynamics in a Wall-less Reactor**," Chemical Engineering Science 59, p. 1115-1130 (2004).
- Lehman, S.Y., Bertness, K.A., and Hodges, J.T., "**Optimal Spectral Region for Real-Time Monitoring of sub-ppm Levels of Water in Phosphine using Cavity Ring-Down Spectroscopy**," J. of Crystal Growth 261, p. 225-230 (2004).
- Li, G., Josowicz, M., Janata, J. and Semancik, S., "**The Effect of Thermal Excitation on Intermolecular Charge Transfer Efficiency to Conducting Polyaniline**," Applied Physics Letters 85, p. 1187-1189 (2004).
- Li, G., Martinez, C., Semancik, S., Smith, J.A., Josowicz, M., and Janata, J., "**The Effect of Morphology on the Response of Polyaniline-Based Conductometric Gas Sensors: Nanofibers vs. Thin Films**," Electrochemical & Solid State Letters 7, p. H44-H47 (2004).
- Li, G. and Semancik, S., "**Controlled Electrophoretic Deposition of Polyaniline Films from a Colloidal Suspension**," J. American Chemical Society (in press).
- Maslar, J.E., Hurst, W.S., Wang, C.A., and Shiau, D.A., "**Non-Contact Determination of Free Carrier Concentration in n-GaInAsSb**," Proc. 2003 Fall Materials Research Soc. Symposium, Vol. 799, p. Z3.5.1 (2004).

- May, E.F., Pitre, L., Mehl, J.B., Moldover, M.R., and Schmidt, J.W., "**Quasi-Spherical Cavity Resonators for Metrology Based on the Relative Dielectric Permittivity of Gases**," Rev. of Scientific Instruments 75, p. 3307 - 3317 (2004).
- May, E.F., Moldover, M.R., Schmidt, J.W., "**The Dielectric Permittivity of Saturated Liquid Carbon Dioxide and Propane Measured using Cross Capacitors**," Intl. J. of Thermophysics (in press).
- Mehl, J.B., Moldover, M.R., and Pitre, L.J., "**Designing Quasi-Spherical Resonators for Acoustic Thermometry**," Metrologia 41, p. 295-304 (2004).
- Meier, D.C., Taylor, C.J., Cavicchi, R.E., White, E., and Semancik, S., "**Chemical Warfare Agent Detection Using MEMS-Compatible Microsensor Arrays**," IEEE Sensors J (in press).
- Meyer, C.W., and Tew, W.L., "**The NIST Low Temperature ITS-90 Realization and Calibration Facilities**," Temperature: Its Measurement and Control in Science and Technology, Vol. 7, Proc. AIP Conf. 684, p. 137-142 (2003).
- Moldover, M.R., Marsh, K.N., Barthel, J., and Buchner, R., "**Chapter 9: Relative Permittivity and Refractive Index**," in Measurement of the Thermodynamic Properties of Single Phases, (edited by A.R.H. Goodwin, K.N. Marsh & W.A. Wakeham) p. 434-473 IUPAC (2003).
- Nakano, T., Tew, W.L., Tamura O., and Sakurai, H., "**Double anomalous peak in the heat capacity just below the triple point of saturated e-H₂ with FeO(OH)**," Intl. J. of Thermophysics (in press).
- Nam, S.W., Benz, S.P., Martinis, J.M., Dresselhaus, P., Tew, W.L., and White, D.R., "**A Ratiometric Method for Johnson Noise Thermometry Using a Quantized Voltage Noise Source**," Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 37-42 (2003).
- Nam, S. W., Benz, S., Dresselhaus, P., Burroughs, C., Tew, W. L., White, D. R., and Martinis, J. M., "**Johnson Noise Thermometry using a Quantized Voltage Noise Source for Calibration**," IEEE Transactions on Instrumentation and Measurement (in press).
- Nguyen, N.V., Maslar, J.E., Kim, J.Y., Han, J. P., Park, J.-W., Chandler-Horowitz, D., and Vogel, E.M., "**Characterization of Structural Quality of Bonded Silicon-on-Insulator Wafers by Spectroscopic Ellipsometry and Raman Spectroscopy**," Proc. 2004 Spring Materials Research Soc. Symposium, Vol. 809, p. B8.19. (2004).
- Nguyen, N.V., Maslar, J.E., Kim, J.-Y., Han, J. P., Park, J.-W., Chandler-Horowitz, D., and Vogel, E.M., "**Crystalline Quality of Bonded Silicon-On-Insulator Characterized by**

- Spectroscopic Ellipsometry and Raman Spectroscopy*,” Appl. Phys. Lett. 85 (14) p. 2765-2767 (2004).
- Petrovykh, D.Y., Kimura-Suda, H., Tarlov, M.J., and Whitman, L.J., “*Quantitative Characterization of DNA Films by XPS*,” Langmuir 20, p. 429-440 (2004).
- Pipino, A.C., Woodward, J.T., Meuse, C.W., and Sillin, V., “*Surface-Plasmon-Resonance-Enhanced Cavity Ring-Down Detection*,” J. of Chem. Physics 120 (3), p. 1585 (2004).
- Pipino, A.C., Meuse, C.W., Hoefnagels, J.P., Silin, V., and Woodward, J.T., “*Novel Chemical Detection Strategies for TCE and PCE*,” Proc. Amer. Chem. Soc. Mtg., (on CD) (2003).
- Pipino, A.C., Hoefnagels, J.P., and Watanabe, N., “*Absolute Surface Coverage Measurement using a Vibrational Overtone*,” J. of Chemical Physics 120 (6), p. 2879 (2004).
- Pipino, A.C., “*Ultra-Sensitive Surface Spectroscopy of Silica with a Miniature Optical Resonator*,” MRS Bulletin (in press).
- Presser, C., Papadopoulos, G., and Widmann, J.F., “*Droplet-Laden Homogeneous Turbulent Flow Past Unheated and Heated Cylinders*,” Proc. ASME/JSME Joint Fluids Engineering Conf. (FEDSM'03) 45240, (on CD) (2003).
- Presser, C., Avedesian, C.T., and Johnson, B.S., “*Phase Doppler Measurements of Liquid Fire Suppressants Over a Heated Cylinder*,” Proc. 42nd AIAA Aerospace Science Meeting & Exhibit, AIAA 2004-0479 (2004).
- Presser, C., and Avedesian, C.T., “*Phase Doppler Measurements of a Liquid Fire Suppressant Spray Over a Heated Cylinder*,” Proc. 17th Annual Conf. on Liquid Atomization and Spray Systems (ILASS Americas 2004), NIST Special Publication 1016 (C. Presser and B. Helenbrook, Eds.), (on CD) (2004).
- Presser, C., and Avedesian, C.T., “*Transport of High Boiling-Point Fire Suppressants in a Droplet-Laden Homogeneous Turbulent Flow Past a Heated Cylinder*,” Atomization and Sprays (in press).
- Richter, L.J., Yang, C.S., Wilson, P.T., Hacker, C.A., and van Zee, R.D., “*Optical Characterization of Oligo(phenylene-ethynylene) Self-Assembled Monolayers on Gold*,” J. of Physical Chemistry B 108 (33), p. 12547-12559 (2004).
- Ripple, D.C., Defibaugh, D.R., Moldover, M.R., and Strouse, G.F., “*Techniques for Primary Acoustic Thermometry to 800 K*,” Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 25-30 (2003).
- Ripple, D.C., Garrity, K.M., and Meyer, C.W., “*A Four-Zone Furnace for Realization of Silver and Gold Freezing Points*,” Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 979-986 (2003).

- Ripple, D.C., and Burns, G.W., "***Thermoelectric Properties of a Selected Lot of Gold versus Platinum Thermocouples,***" Proc. TEMPMEKO 2004 (in press).
- Ross, D., and Locascio, L.E., "***The Effect of Caged Fluorescent Dye on the Electroosmotic Mobility in Microchannels,***" Analytical Chemistry **75**, p. 1218-1220 (2003).
- Ross, D., Ivory, C.F., Locascio, L.E. and Van Cott, K.E., "***Peak Compression and Resolution for Electrophoretic Separation in Diverging Microchannels,***" Electrophoresis (in press).
- Ross, D., Balss, K.M., Howell, P.B., and Vreeland, W.N., "***MAGF: A New Method for High-Performance Focusing of Uncharged and Hydrophobic Analytes,***" Proc. Micro Total Analysis Systems 2003, p. 1045-1048 (2003).
- Rusby, R.L., Meyer, C.W., Tew, W.L., Head, D.I., Hill, K.D., Tamura, O., de Groot, M.J., Fellmuth, B., Storm, A., Peruzzi, A., Engert, J., Astrov, D.N., Dedikov, Y., Kytin, G.A., "***CCT Key Comparison No. 1 (CCT-K1): Realizations of the ITS-90, 0.65 K to 24.5561 K, using Rhodium-Iron Resistance Thermometers,***" Proc. TEMPMEKO 2004 (in press).
- Savage, N.O., Roberson, S.V., Gillen, J.G., Tarlov, M.J., and Semancik, S., "***Thermolithographic Patterning of Sol-Gel Oxides on Microhotplate Sensing Arrays using Organosilanes,***" Analytical Chemistry **75**, p. 4360-4367 (2003).
- Semancik, S., "***Temperature-Dependent Materials Research with Micromachined Array Platforms,***" Combinatorial Materials Synthesis (Invited Chapter), Editors: X.D. Xiang I. Takeuchi, Marcel Dekker, Inc., p. 263-295 (2003).
- Semancik, S., "***Temperature-Controlled MEMS Chemical Microsensors,***" Proc. 1st Natl. Inst. of Advanced Industrial Science & Technology (AIST) Intl. Chemical Sensor Workshop (in press).
- Sengers, J.V. and Moldover, M.R., "***Comment on Molecular Dynamics Simulations of a Fluid Near its Critical Point,***" Phys. Rev. Letters (in press).
- Sharpe, S.W., Johnson, T.J., Sams, R.L., Chu, P.M., Rhoderick, G.C., and Johnson, P.A. "***The NIST and PNNL Gas-Phase Databases for Quantitative Infrared Spectroscopy,***" Applied Spectroscopy 2004 (in press).
- Sobolewski, M.A., "***Monitoring Sheath Voltages and Ion Energies in High-Density Plasmas using Noninvasive Radio-Frequency Current and Voltage Measurements,***" AIP Conf. Proc. 683, Proc. 2003 Intl. Conf. on Characterization and Metrology for ULSI Technology, p. 195-199 (2003).
- Sobolewski, M.A., "***Monitoring Sheath Voltages and Ion Energies in High-Density Plasmas using Noninvasive Radio-Frequency Current and Voltage Measurements,***" J. of Applied Physics **95**, p. 4593-4604 (2004).

- Sobolewski, M.A., "***Non-invasive Monitoring of Ion Energy Drift in an Inductively Coupled Plasma Reactor,***" *J. of Applied Physics* (in press).
- Sobolewski, M.A., "***Real-Time Monitoring of Ion Energy and Ion Flux in Plasma Reactors using RF Current and Voltage Measurements,***" *Proc. of Soc. of Vacuum Coaters* (in press).
- Steffens, K.L., and Sobolewski, M.A., "***A Technique for Temperature Mapping in Fluorocarbon Plasmas using Planar Laser-Induced Fluorescence of CF,***" *J. of Applied Physics* 96 (1), p. 71-81 (2004).
- Steffens, K.L., and Sobolewski, M.A., "***2-D Imaging of Temperature in CF₄ Plasmas,***" *IEEE Transactions on Plasma Science* (in press).
- Strouse, G.F., and Hill, K.D., "***Performance Assessment of Resistance Ratio Bridges used for the Calibration of SPRTs,***" *Temperature: Its Measurement and Control in Science and Industry*, Vol. 7, *Proc. AIP Conf.* 684, p. 327-332 (2003).
- Strouse, G.F., "***Internal Measurement Assurance for the NIST Realization of the ITS-90 from 83.8 K to 1234.93 K,***" *Temperature: Its Measurement and Control in Science and Industry*, Vol. 7, *Proc. AIP Conf.* 684, P. 879-884 (2003).
- Strouse, G.F., Defibaugh, D.R., Moldover, M.R., and Ripple, D.C., "***Progress in Primary Acoustic Thermometry at NIST: 273 K to 505 K,***" *Temperature: Its Measurement and Control in Science and Industry*, Vol. 7, *Proc. AIP Conf.* 684, p. 31-36 (2003).
- Strouse, G.F., "***Standard Reference Material 1751-A Gallium Melting-Point Standard,***" NIST SP 260 (in press).
- Strouse, G.F., "***NIST Certification of ITS-90 Fixed-Point Cells from 83.8058 K to 1234.93 K: Methods and Uncertainties,***" *Proc. TEMPMEKO 2004* (in press).
- Strouse, G.F. and Ripple, D.C., "***Thermometry Proficiency Tests,***" NVLAP Lab Bulletin LB-10-2004 (2004).
- Taylor, C.J., Cavicchi, R.E., and Montgomery, C.B., "***Microarray Approach for Optimizing Localized Deposition of Carbon Nanotubes using Microhotplate Arrays,***" *Nanotechnology* 15(1), p. 62-65 (2004).
- Tew, W.L., and Meyer, C.W., "***Recent Results of NIST Realizations of the ITS-90 Below 84 K,***" *Temperature: Its Measurement and Control in Science and Industry*, Vol. 7, *Proc. AIP Conf.* 684, p. 143-148 (2003).
- Tsai, B.K., DeWitt, D.P., Early, E.A., Hanssen, L.M., Mekhontsev, S.N., Kreider, K.G., Lee, B.J., and Zhang, Z., "***Emittance Standards for Improved Radiation Thermometry during Thermal Processing of Silicon Materials,***" *Proc. TEMPMEKO 2004* (in press).

- Tsai, B.K., DeWitt, D.P., Kreider, K.G., Kimes, and W.A., "***Emissivity Compensated Pyrometry for Specular Silicon Surfaces on the NIST RTP Testbed,***" Proc. 12th IEEE Intl. Conf. on Advanced Thermal Processing of Semiconductors, RTP 2004, J. Gelpey, et al. editors, Sept 2004, Portland, OR. p. 167-172 (2004).
- Vaughn, C.D., and Strouse, G.F., "***NIST Calibration Uncertainties of Liquid-in-Glass Thermometers over the Range from -20°C to 400°C,***" Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 447-452 (2003).
- Vorsa, V., Dheandhanoo, S., Ketkar, S., and Hodges, J.T., "***Quantitative Absorption Spectroscopy of Residual Water Vapor in High Purity Gases: Pressure-Broadening of the 1.39253 μm H_2O Transition by N_2 , HCl , HBr , Cl_2 , and O_2 ,***" Applied Optics (in press).
- White, D.R., Dransfield, T.D., Strouse, G.F., Tew, W.L., Rusby, R.L., and Gray, J., "***Effects of Heavy Hydrogen and Oxygen on the Triple-Point Temperature of Water,***" Proc. Temperature: Its Measurement and Control in Science and Industry, Vol. 7, Proc. AIP Conf. 684, p. 221-226 (2003).
- Wright, J.D., Moldover, M.R., Johnson, A., and Mizuno, A., "***Volumetric Gas Flow Standard with Uncertainty of 0.02% to 0.05%,***" J. of Fluids Engineering 125, p. 1058-1066 (2003).
- Wright, J. D., Johnson, A. N., Moldover, M. R., and Kline, G. M., "***Gas Flowmeter Calibrations with the 34 L and 677 L PVTt Standards,***" NIST Special Publication 250-63 (2004).
- Yeh, T.T., Espina, P.I., Mattingly, G.E., and Briggs, N., "***An Uncertainty Analysis of a NIST Hydrocarbon Liquid Flow Calibration Facility,***" Proc. 2004 Heat Transfer/Fluid Eng. Conf., p. 1-12 (2004).
- Zangmeister, C.D., Robey, S.W., van Zee, R.D., and Tour, J.M., "***Frontier Electron Orbitals of OPE-Thiolate on Gold,***" J. of the American Chemical Society 126, p. 3420-3421 (2004).
- Zangmeister, C.D., Robey, S.W., and van Zee, R.D., "***Polarization Dependent Photoemission Spectroscopic Investigation of a Series of Thiol-Bound Oligo(Phenylene Ethynylene) Based Self-Assembled Monolayers on Au,***" (in press).
- Zangmeister, R.A., and Tarlov, M.J., "***Selective DNA Sensing Elements Integrated into Microfluidic Channels,***" Proc. MicroTAS 2003, 7th Intl. Conf. on Micro Total Analysis Systems 2 (13), p. 1343-1346 (2003).
- Zangmeister, R.A., and Tarlov, M.J., "***DNA Displacement Assay Integrated into Microfluidic Channels,***" Analytical Chemistry 76, p. 3655-3659 (2004).

Zangmeister, R.A., and Tarlov, M.J., "*Selective DNA Screening in Microfluidic Channels by Electrophoresis Through Hydrogel Matrices,*" Proc. 2004 AIChE Natl. Meeting & Conf. (in press).

2. Talks

- Berg, R.F., "***Quartz Capillary Gas Flow Meters***," AVS 50th International Symposium, Baltimore, MD, November 5, 2003.
- Berg, R.F., "***Shear Thinning Near the Critical Point: First Results from CVX-2 on STS-107***," STS-107 Postflight Investigator Working Group, Houston, TX, February 11, 2004.
- Espina, P.I., "***National Flow Metrology Programs in the Americas***," COOMET Technical Committee 1.4 Meeting (Flow Measurement), Kharkov, Ukraine, November 20, 2003.
- Espina, P.I., "***The North American Natural Gas Laboratory Comparison Project***," CIPM-CCM-FF-K5 Meeting, Essen, Germany, December 10, 2003.
- Espina, P.I., "***The New NIST Liquid Hydrocarbon Flow Calibration Service***," Measurement Science Conference, Anaheim, CA, January 15, 2004.
- Kreider, K.G., "***Comparing the Transient Response of a Resistive-Type Sensor with a Thin-Film Thermocouple during the Post-Exposure Bake Process***," SPIE 29th Intl. Symp. on Microlithography, Santa Clara, CA, February 23, 2004.
- Kreider, K.G., "***In Situ Calibration of Lightpipe Radiometers in Rapid Thermal Processing Between 300 °C and 700 °C***," 12th IEEE International Conference on Advanced Thermal Processing of Semiconductors, RTP 2004, Portland, OR, September 29, 2004.
- Martinez, C.J. and Semancik, S., "***Engineering of High Surface Area Tin Oxide Nanoparticle Structures for Sensor Applications***," 78th ACS Colloid and Surface Science Symposium, New Haven, CT, June 20, 2004.
- Maslar, J.E., "***Non-Contact Determination of Free Carrier Concentration in n-GaInAsSb***," Materials Research Society 2003 Fall Meeting, November 2003.
- Meier, D.C., "***MEMS Chemical Sensors for Homeland Security***," AVS 50th International Symposium and Exhibition, Baltimore, MD, November 4, 2003.
- Meier, D.C., "***MEMS Gas Sensors for Chemical Warfare Agent Detection***," Pittcon 2004, Chicago, IL, March 11, 2004.
- Meier, D.C., "***Interference Effects on Chemical Warfare Agent Detection by MEMS-Based Microsensor Arrays***," 10th International Meeting on Chemical Sensors, Tsukuba, Japan, July 12, 2004. Invited.
- Meier, D.C., "***The Development of Temperature-Controlled Microanalytical Components for Space Exploration***," 10th International Meeting on Chemical Sensors, Tsukuba, Japan, July 13, 2004.

- Moldover, M.R., ***“Will Quasi-Spheres and Cross Capacitors Become Primary Temperature and Pressure Standards?”*** Colloqui 35^e Anniversaire du Bureau National de Metrologie, Paris, France, September 22, 2004.
- Pipino, A., ***“Novel Applications of Cavity Ring-Down Spectroscopy,”*** Eindhoven University of Technology, Eindhoven, The Netherlands, December 2, 2003. Invited.
- Pipino, A., ***“Novel Applications of Cavity Ring-Down Spectroscopy,”*** University of Ulm, Ulm, Germany, December 15, 2003. Invited.
- Pipino, A., ***“Probing Silica Hydroxyl Species with Cavity Ring-Down Spectroscopy,”*** Heraeus-Tenevo AG, Hanau, Germany, December 17, 2003. Invited.
- Presser, C., ***“Absorption Coefficient Measurements of Aerosol Particle Agglomerates,”*** 22nd Annual AAAR Conference, Anaheim, CA, October 23, 2003
- Presser, C., ***“Phase Doppler Measurements of Liquid Fire Suppressants over a Heated Cylinder,”*** 42nd AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 6, 2004.
- Presser, C., ***“Phase Doppler Measurements of a Liquid Fire Suppressants Spray over a Cylinder,”*** 17th Annual Conf. on Liquid Atomization and Spray Systems (ILASS Americas '04), Arlington, VA, May 18, 2004.
- Ripple, D.C., ***“Drift of Base-Metal Thermocouples at 200 °C over One Year,”*** ASTM Committee E20 Colloquium, Tampa, FL, November 19, 2003. Invited.
- Ripple, D.C., ***“Definition of the National Temperature Standard for a Given Fixed Point,”*** CCT Workshop on Uncertainty in Temperature Fixed Points, Cavtat, Croatia, June 26, 2004. Invited.
- Ripple, D.C., ***“Thermoelectric Properties of a Selected Lot of Gold versus Platinum Thermocouples,”*** TEMPMEKO 2004, Cavtat, Croatia, June 24, 2004.
- Semancik, S., ***“Studying Surface Phenomena by Pulsed Heating of Microdevices”*** 50th International Meeting of the American Vacuum Society, Baltimore, MD, November 4, 2003.
- Semancik, S., ***“Using MEMS Microarrays and Neural Networks to Identify Preferred Surface Chemistry in Application-Specific Gas Sensing”*** 50th International Meeting of the American Vacuum Society, Baltimore, MD, November 5, 2003.
- Semancik, S., ***“Temperature-Dependent Studies of Gas Sensing Materials Using MEMS Microarrays,”*** 2003 Fall Meeting of the Materials Research Society, Boston, MA, December 3, 2003. Invited.

- Semancik, S., "***Solid State Microsensors for Detecting Chemical Warfare Agents***," 4th Intl. Symposium on Detection Technologies, Arlington, VA, December 9, 2003. Invited.
- Semancik, S. "***Concepts, Materials and Fabrication Issues for Developing Advanced Chemical Microsensors***," Ceramics Division Seminar, January 20, 2004. Invited.
- Semancik, S., "***Developing Temperature-Controlled MEMS Microdevices for Chemical Warfare Agent Detection***," 3rd TSA Microsensors Workshop, Scottsdale, AZ, April 22, 2004. Invited.
- Semancik, S., "***The Use of Nanostructured Materials in MEMS-Based Solid State Chemical Sensors***," Gordon Research Conference on Nanostructure Fabrication, Tilton, NH, July 19, 2004.
- Sobolewski, M.A., "***Real-time Monitoring of Drifting Ion Flux and Ion Energy in a High-Density, Inductively Coupled Plasma***," 56th Annual Gaseous Electronics Conference, San Francisco, CA, October 21, 2003.
- Sobolewski, M.A., "***Real-time Monitoring of Ion Energy and Ion Flux in Plasma Reactors Using RF Current and Voltage Measurements***," Technical Conference of the Society of Vacuum Coaters, Dallas, TX, April 28, 2004. Invited.
- Sobolewski, M.A., "***Real-time, Nonintrusive Monitoring of Time-Varying Ion Energy and Flux in Inductively Coupled Plasmas***," 57th Annual Gaseous Electronics Conference, Bunratty, County Clare, Ireland, September 26, 2004.
- van Zee, R.D., "***Valence Electronic Structure of Oligo(phenylene-ethynylene) on Gold***," Material Research Society National Meeting, Boston, MA, November 2003.
- van Zee, R.D., "***Band Lineup of Chemisorbed Oligo(phenylene-ethynylene)s***," DARPA MoleApps Meeting, Reston, VA, June 2004. Invited.
- van Zee, R.D., "***Valence Electronic Structure of Substituted Oligo(phenylene-ethynylene)s***," Northwestern University, Evanston, IL, July 2004. Invited.
- Wright, J.D., "***Status of the Low-Pressure Gas Flow Key Comparison (CCM-FF-K6)***," CIPM Working Group for Fluid Flow, Anaheim, CA, January 14, 2004.
- Wright, J.D., "***A Survey of the Flow Standards Participating in the CIPM Low-Pressure Gas Flow Key Comparison (CCM-FF-K6)***," Measurement Science Conference, Anaheim, CA, January 15, 2004.
- Wright, J.D., "***Gas Flow Measurements and Standards: Development and Validation of a PVTt Primary Gas Flow Standard***," Kogakuin University, Tokyo, Japan, June 10, 2004.

Yeh, T.T., “*NIST Hydrocarbon Liquid Flow Calibration Facility: Piston Prover,*” CCG Meeting, Scottsdale, AZ, November 4, 2003.

Zangmeister, C.D., van Zee, R.D., and Robey, S.W., “*ZP-PES Studies of Molecular Affinity Levels of OPE Self-Assembled Monolayers,*” AVS 50th International Symposium, Baltimore, MD, November 2003.

Zangmeister, R. A. and Tarlov, M. J. “*Selective DNA Sensing Elements Integrated into Microfluidic Channels,*” MicroTAS 2003 Conference, Lake Tahoe, CA, October 2003.

Zangmeister, R. A. and Tarlov, M. J., “*Pb²⁺ Sensitive Catalytic DNA Assay Integrated into Microfluidic Channels,*” AVS 50th International Symposium, Baltimore, MD, November 2003.

Zangmeister, R. A., “*Integration of Hydrogel Based Bioassays into Microfluidic Channels,*” Princeton University, November 18, 2003. Invited.

Zangmeister, R. A. and Tarlov, M. J., “*Integration of Hydrogel Based Bioassays into Microfluidic Channels,*” LabAutomation 2004, San Jose, CA, February 1-5, 2004.

3. Cooperative Research and Development Agreements (CRADAs) and Consortia

Temperature Sensing for Semiconductor Thermal Processing 300 °C to 650 °C

K.G. Kreider

Sensarray Corp. (CRADA)

4. Patent Awards and Applications

Balss, K.M., Ross, D.J., and Tarlov, M.J., "Mixing Reactions by Temperature Gradient Focusing," (NIST Docket No. 04-020, Patent Pending)

Locascio, L.E., Ross, D.J., Tarlov, M.J., and Barker, S.L.R., "Polyelectrolyte Derivatization of Microfluidic Devices," (NIST Docket No. 00-031, Patent Pending)

Johnson, T.J., Waddell, E.A., Ross, D.J., Locascio, L.E., "Surface Charge Modification within Preformed Microchannels to Modulate Flow and Fabrication of Microarrays by Laser Ablation in Preformed Polymer Microchannels," (NIST Docket No. 01-005 and 01-006, Patent Pending)

Johnson, T.J., Ross, D.J., and Locascio, L.E., "Microfluidic Flow Manipulation Device," (Non-Provisional Application Filed)

Pipino, A.C.R., "Optical Probes for Chemical and Biochemical Detection in Liquids," (NIST Docket No. 03-006, Provisional Application Filed, Patent Pending)

Ross, D.J., Locascio, L.E., "Simplified Methods for Electrokinetic Focusing in Microfluidic Devices," (NIST Docket No. 01-029, Patent Pending)

Ross, D.J., Howell, P., and Vreeland, W., "Micellar Gradient Focusing," (NIST Docket No. 03-008, Patent Pending)

Ross, D.J., Balss, K.M., "Chiral Temperature Gradient Focusing," (NIST Docket No. 04-007, Patent Pending)

Ross, D.J., and Mallaris, C.D., "Whole Column Resistance Detection for Focusing Methods of Separation, NIST Docket No. 04-008, Patent Pending)

Tarlov, M.J., Ross, D.J., and Olsen, K.E., "Bio-Affinity Gel Plugs in Microfluidic Channels," (NIST Docket No. 02-004, Non-Provisional Application Filed)

Thomas, O., Cavicchi, R.E., and Tarlov, M.J., "Fast Transient Microscale Heating for Chemical and Biochemical Detection," NIST Docket No. 02-006PA, Provisional Application Filed)

Zangmeister, C.D., van Zee, R.D., "Selective Electroless Attachment of Contacts to Electrochemically-Active Molecules," (NIST Docket No. 02-008, Patent Pending).

5. SRM Activities

2243 Relative Intensity Correction Standard for Raman Spectroscopy: 488 nm and 514.5 nm Excitation (completed)

6. SRD Activities

None.

8. Committee Assignments

P.J. Abbott

AVS Recommended Practices Standards Committee
AVS Recommended Practices Subcommittee on Ionization Gauge Calibration
AVS Technology Division Executive Committee
CIPM C002 Consultative Committee on Mass and Related Quantities
SC.04 Low Pressure
NIST Research Library Advisory Board
Peer Review Board of NRLM AIST (Tsukuba, Japan) Pressure & Vacuum Calibration Facility

M.J. Carrier

NIST Information Technology Services Planning Team

P.M. Chu

ASTM E13
SC03 Molecular Spectroscopy and Chromatography
Calibration Coordination Group-Chemical and Biological Defense
Carbon Cycle Interagency Working Group

R.G. Driver

CSTL Diversity Committee
NCSL Intrinsic and Derived Standards Committee, Deadweight Pressure Gauges

P.I. Espina

CIPM Consultative Committee on Mass and Related Quantities
WG Fluid Flow (WGFF)
Gas Technology Institute MTAG
SIM TWG10 Flow and Related Quantities, Chair
NORAMET TC: Mechanical Area
API Committee on Petroleum Measurements

K.M. Garrity

ASTM E020 Temperature Measurement
SC.04 Thermocouples

K.A. Gillis

NIST Information Technology Services Planning Team
NIST Scientific Computing Working Group

J.H. Hendricks

AVS Recommended Practices Subcommittee on Ionization Gauge Calibration

P.H. Huang

ASTM D022 Sampling and Analysis of Atmospheres
SC.09 ISO Tag for ISO/TC146 (Air Quality)

SC.11 Meteorology
CIPM International Committee on Weights and Measures
CCT Consultative Committee on Thermometry
WG6-Humidity Measurements, Chair
SEMI C012 Test Methods and Recommended Practices
SC.02 Gases/Semiconductor
WG.02 Moisture Measurements in Gases

J.J. Hurly

SEMI C012 Gases
SEMI C014 Facilities

W.S. Hurst

ASTM E013 Molecular Spectroscopy and Chromatography
SC.08 Raman Spectroscopy

A. Lee

CIPM C002 Consultative Committee on Mass and Related Quantities
WG2-High Pressure
WG4-Low Pressure
WG6-Medium Pressure
NIST Diversity Advisory Board, Chair
CSTL Diversity Committee, Chair

J.P. Looney

AVS Vacuum Technology Division Executive Committee
AVS Recommended Practices Committee on Spinning Rotor Gages
CIPM C002 Consultative Committee on Mass and Related Quantities
SC.04 Low Pressure

C.W. Meyer

ASTM E020 Temperature Measurement
CIPM International Committee on Weights and Measures
CCT Consultative Committee on Thermometry
WG3-Uncertainties

A.P. Müller

AVS Recommended Practices Subcommittee on Thermal Conductivity Gauging
AVS C0009 Low Pressure Gauges
CIPM Consultative Committee on Mass and Related Quantities
WG2-High Pressure
WG4-Low Pressure, Chairman
WG6-Medium Pressure
International Advisory Committee, 4th CCM Intl. Conference on Pressure Metrology
Peer Review Panel for Pressure & Vacuum Facility at the National Physical Laboratory (New Delhi, India)

M.R. Moldover

CIPM International Committee on Weights and Measures
CCT Consultative Committee on Thermometry
WG4-Thermodynamic Temperature Determination and Extension of ITS-90 to
Lower Temperatures

D. Olson

CIPM C002 Consultative Committee on Mass and Related Quantities
SC.02 High Pressure
NCSLI Intrinsic and Derived Standards Committee, Deadweight Pressure Gauges

C. Presser

AAAR Combustion and Fundamental Aerosol Chemistry Working Group
AIAA Terrestrial Energy Systems Technical Committee
AIAA Computational Fluid Dynamics Committee on Standards
ASME HTD Committee on Heat Transfer in Energy Systems
ASME FACT Committee for Academic and Industrial Research
ASME CIE Energy Systems Technical Committee
ASTM E029 Particle Size Measurement
SC.03 International Cooperation on Terminology, Standards, and Methods
SC.04 Liquid Particle Measurement
SC.05 Reference Materials
CCSP Carbon Cycle Interagency Working Group
CENR Air Quality Research Subcommittee
Combustion Institute Program Review Subcommittee
ILASS Diesel and Automatic Spray Technical Committee
ILASS Computation and Modeling Technical Committee
ILASS Measurement and Instrumentation Technical Committee
North American Research Strategy for Tropospheric Ozone Executive Assembly

D.C. Ripple

ASME C019 Performance Test Codes
SC.03 Temperature Measurement, Chair
ASTM E020 Temperature Measurement
SC.04 Thermocouples
CIPM International Committee on Weights and Measures
CCT Consultative Committee on Thermometry
WG1-Defining Fixed Points and Interpolating Instruments, Chair

J.W. Schmidt

NCSLI 144 Intrinsic and Derived Standards
SC.01 Consensus Standards Committee on Dead-Weight Pressure Gauges

S. Semancik

Program Committee, 9th International Meeting on Chemical Sensors

K.L. Steffens

AVS Plasma Science and Technology Executive Committee

G.F. Strouse

ASTM E020 Temperature Measurement

SC.03 Resistance Thermometers

SC.06 New Thermometers and Techniques

SC.07 Fundamentals in Thermometry

CIPM International Committee on Weights and Measures

CCT Consultative Committee on Thermometry

WG7-Key Comparisons

WG8-Calibration and Measurement Capabilities, Chair

NIST Assessment Review Board

SIM InterAmerican System of Metrology

TC Technical Committee

MWG3 Temperature, Chair

M.J. Tarlov

AVS Biochemical Interfaces Steering Committee

CSTL Colloquium Committee

W.L. Tew

ASTM E020 Temperature Measurement

SC.03 Resistance Thermometers

SC.06 New Thermometers and Techniques

SC.07 Fundamentals in Thermometry

IEC TC065 Industrial Process Measurement and Control

SC65B Elements of Systems

WG05 Temperature Sensors

R.D. van Zee

Plyler Prize Development Committee (APS)

DARPA Source Evaluation Board (BAA03-13)

NSF NIRT Panel on New Electronic Materials

C.D. Vaughn

ASTM E020 Temperature Measurement

SC.05 Liquid-in-Glass Thermometers and Hydrometers, Secretary

J.R. Whetstone

ISA C002 Standards and Practices Board

T.T. Yeh

ASME MFC

SC.09, Ultrasonic Flowmeters

9. Editorships

C. Presser

Editorial Board of Atomization and Sprays

C. Presser

Proceedings of ILASS Americas 2004 Conference, NIST Special Publication 1016 (2004)

D.C. Ripple, B.C. Johnson, C.W. Meyer, R.D. Saunders, G.F. Strouse, W.L. Tew, B.K. Tsai, H.Y. Moon

Temperature: Its Measurement and Control in Science and Industry, Vol. 7, AIP CP684, AIP Conference Proceedings, Melville, NY (2003)

S. Semancik

Editorial Board, Sensors and Actuators B

Editorial Board, Sensor Letters

10. Seminars

October 31, 2003

James R. White, Dept. of Mechanical Engineering, MIT, Cambridge, MA

“Controlling Gas and Liquid Flows with the Nanogate,” (Division Sponsor: M. Tarlov)

November 13, 2003

Rasti Levicky, Dept. of Chemical Engineering, Columbia University, New York, NY

“Detection of Biological Molecules: From Self-Assembled Films to Self-Integrated Devices,” (Division Sponsor: M. Tarlov)

November 20, 2003

Stanislaus S. Wong, State University of New York, Stony Brook, NY

“Chemical Functionalization Strategies for Carbon Nanotubes” (Division Sponsor: M. Tarlov)

December 1, 2003

Robert Benyon, Temperature and Humidity Laboratory, Torrejón de Ardoz, Spain

“Transmitting Confidence Through Accreditation: Implications in the Field of Temperature and Humidity,” (Division Sponsor: G. Strouse)

December 5, 2003

Jeremy Beebe, University of Minnesota, Minneapolis, MN

“Characterization of Nanoscale Molecular Junctions by Conducting Probe Atomic Force Microscopy,” (Division Sponsor: R. van Zee)

January 16, 2004

Dr. Ming Zheng, DuPont Central Research & Development, Wilmington, DE

“Manipulating Carbon Nanotubes with DNA,” (Division Sponsor: M. Tarlov)

February 10, 2004

Shoaib Isman, University of Cincinnati, Cincinnati, OH

“Experimental Observation of Radio Turbulence,” (Division Sponsor: G. Mattingly)

April 9, 2004

Simon Garcia, Cornell University, Ithaca, NY

“Chemical Control of Surface Morphology at Large Length Scales: Bunching During Aqueous Silicon Etching,” (Division Sponsor: S. Semancik)

April 13, 2004

Michael N. Rychagov, MIET, Moscow, Russia

“Ultrasonic Flow Measurements by Multipath Measuring Spoolpieces: Quadrature Integration and Tomographic Reconstruction,” (Division Sponsor: G. Mattingly)

April 23, 2004

Prof. Jiri Janata, Georgia Institute of Technology, Atlanta, GA

“Conducting Polymers in Sensors and in Molecular Electronics,” (Division Sponsor: S. Semancik)

May 25, 2004

Kuldeep Prasad, BFRL, NIST

“Coupled Fire Dynamics & Thermal Response of Complex Building Structures,”
(Division Sponsor: A. Lee)

July 20, 2004

Angus Henderson, Aculight Corporation, Bothell, WA

“Mid-Infrared Sources for Spectroscopy,” (Division Sponsor: J. Hodges)

July 20, 2004

Nhlanhla Yende, CSIR-National Metrology Lab., South Africa

“The Progress of the CSIR-NML Liquid Flow Calibration Facility,” (Division Sponsor: P. Espina)

11. Conferences/Workshops/Sponsored or Co-Sponsored Sessions

January 12-13, 2004

Selection, Use and Calibration of Contact Thermometers, Measurement Science Conference
NIST Seminar, Anaheim, CA (G. Strouse, K. Garrity)

March 15-19, 2004

Precision Thermometry Workshop, Gaithersburg, MD (K. Garrity, C. Meyer, W. Kimes, D. Ripple, G. Strouse, W. Tew, C. Vaughn)

May 17-18, 2004

Liquid-in-Glass Thermometer Mini-Workshop, Gaithersburg, MD (C. Vaughn, G. Strouse)

May 16-19, 2004

Institute for Liquid Atomization and Spray Systems (ILASS) Americas 2004 Conference,
Arlington, VA (C. Presser)

August 20-21, 2004

ITS-90 Fixed-Point Cell Mini-Workshop, Gaithersburg, MD (G. Strouse)