DIAGNOSTIC INSTRUMENTATION AND ANALYSIS LABORATORY
Bagley College of Engineering, Mississippi State University

Annual Report to the Vice President for Research
for the period July 1, 2004 - June 30, 2005

BRIEF DESCRIPTION AND PURPOSE

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) continues its 29-year tradition of excellence in diagnostic and engineering research at Mississippi State University (MSU). Prior to 1993, the majority of its funding was from the Office of Technology Development within the Office of Environmental Management of the U.S. Department of Energy (DOE). Since then, a vigorous diversification program has been established with sponsors from other branches of government including the Department of Defense (DOD), Department of Homeland Security (DHS), NASA, DOE-Fossil Energy, and EPA, along with specific industrial partners and consortia.

DIAL is an interdisciplinary research department in the College of Engineering. A number of the professionals hold joint appointments in academic departments in the Bagley College of Engineering and the College of Arts & Sciences. DIAL has the distinction of being the longest continuously funded research program in the College of Engineering with funding in excess of $92 million dollars since 1976. DIAL is among the leaders at MSU in the development of intellectual property with more than 25 patents and licenses applied for by the staff to date. Since 1976, DIAL has supported more than 400 students who were seeking masters and doctoral degrees.

The DIAL facility is a 58,000-square-foot, state-of-the-art building located on eight acres in the Thad Cochran Research Park. The facility consists of 41 faculty and administrative offices, two classrooms, a 100-seat auditorium, a machine shop, a high-bay test area, 16 research laboratories, and numerous graduate student offices. Funding for this facility was provided through a grant from the Department of Energy and with matching funds from the State of Mississippi.

MISSION

The mission of the Diagnostic Instrumentation and Analysis Laboratory is to provide solutions for process characterization, monitoring, control and optimization problems. DIAL is expanding its efforts in diagnostics, computer modeling and simulation, engineering system evaluation, outreach, and economic development to benefit government agencies and the environmental, energy, heating, chemical, and petroleum industries. This transfer of technology broadens the base of sponsor investment in research and development.

RESEARCH PROGRAM

The research program at DIAL includes the development and application of advanced diagnostic systems, analytical model development and validation, test facilities process development, and on-site field measurements and analysis. Current focus areas include studies on remediation of the legacy wastes remaining following the Cold War, the evaluation and assessment of alternative energy sources and processes, and the development and application of modern, non-intrusive diagnostic instruments for monitoring and controlling engineering systems.

IMPACTS OF OUR PROGRAMS

DIAL scientists and engineers have:

- contributed to improved operating efficiency of glass furnaces.
- developed a cost effective diagnostic technique for early detection of diabetes.
- helped ensure future testing activity at NASA/Stennis after the Space Shuttle program.
- helped resolve issues related to both metal media filters and conventional glass fiber filters for the ASME Committee on Nuclear and Air Gas Treatment Filtration subcommittee.
- developed a novel concept, phytomineralization, for enhancing terrestrial carbon sequestration and preventing global warming.
- developed engineered nanomaterials for cost-effectively removing mercury, arsenic and other toxic elements from drinking water and waste water and for potential remediation at DOE sites.
- completed an assessment of state-by-state potential for terrestrial sequestration, including state inventories, potential and economic impacts of terrestrial carbon sequestration in eleven southeastern and south central states.
- developed fiber optic sensors using sol-gel derived refractive materials as transducer for high temperature gas sensing in clean coal technology.
- developed an optical fiber moisture level sensor for long-term, real-time monitoring of moisture level changes in DOE's waste tanks.
- developed a portable real-time LWIR spectral imaging system for the Department of Homeland Security for continuous active monitoring of selected chemicals in large confined spaces.

Table 1: Proposals submitted between July 1, 2004 and June 30, 2005.

PIs	Title	Funding Source	Type $$	Total Amount
Smith	Development and testing of unique radiation detection technology and particle size distribution	US DOE LANL	Federal	30,865
Plodinec	Energy assessment of a fiberglass production system utilizing electric melting	Johns-Mansville	Private	55,540
Singh Yueh	Real time, on-line and non-intrusive detection of hydrates using raman spectroscopy	Univ. of Miss.		151,927
Jang	Furnace fireball location system	TVA	Federal	7,000
Rogers	Investigation of emulsions for retarding the transport of dispersed radionuclides	WES ARMY US DOD	Federal	49,970
Plodinec	Accelerating cleanup of the defense nuclear legacy	US DOE	Federal	5,000,000
Singh Yueh	Hydrocarbon rocket engine plume imaging by laser induced incandescence	CAEC, LLC	Federal/ Private	23,310
Singh Yueh	Hydrocarbon rocket engine plume imaging by laser induced incandescence	CAEC, LLC	Federal/ Private	60,000

Table 1: Proposals submitted between July 1, 2004 and June 30, 2005.

Singh Yueh	Non-intrusive, real time, on-line temperature sensor for superheated hydrogen at high pressure and high flow	CAEC, LLC	Federal/ Private	60,000
Singh Yueh	Temperature measurement of superheated hydrogen at high pressure and high flow	CAEC, LLC	Federal/ Private	23,310
Luthe Singh	Modeling of radiance and transmittance of a rocket engine plume	CAEC, LLC	Federal/ Private	60,000
Wang	Development of inexpensive and sensitive breath analyzer for diabetes diagnosis	LifeClinic, Inc.	Private	150,000
Wang	Development of inexpensive and sensitive breath analyzer for diabetes diagnosis	Generex, Inc.	Private	100,000
Waggoner	New physics-based deposition function	NSF	Federal	250,155
Etheridge	Micellar gas-hydrate process to capture carbon dioxide	US DOE	Federal	640,236
Han Su	Phytomineralization for long-term terrestrial carbon sequestration	US DOE	Federal	560,827
Lindner	Hanford medium/low curie waste pretreatment alternatives project	CH2M Hanford Group, Inc.	US DOD	347,458
Fanguy Giordana Tao	Optical fiber gas sensors for monitoring IGCC processes based on *in situ* fiber optic spectroscopy with sol-gel derived materials as transducers	US DOE	Federal	524,207
Giordana Palmer	Low temperature waste immobilization using hydroceramic cement	US DOE	Federal	74,273
Giordana Palmer	Low temperature waste immobilization using chemically bonded phosphate ceramics	RIC		82,565
Giordana Palmer	Tank waste enhanced processing by AVS	US DOE	Federal	416,087
Wang J. Parsons	Development of fiber optical sensors for refractory monitoring	US DOE	Federal	140,000
Norton Palmer	Technology to support the design of a nuclear propulsion and power non-nuclear (NP2N) test facility	NASA	Federal	15,000
Singh Yueh	NASA-STTR phase II	MS Ethanol	Federal/ Private	303,326
Singh	Profiling heterogeneity in breast cancer cells — a novel approach for identifying chemotherapeutic resistance and phenotypic changes by laser induced breakdown spectroscopy	US DOE	Federal	51,871
Jang	Furnace fireball location system	TVA	Federal	13,100

Table 1: Proposals submitted between July 1, 2004 and June 30, 2005.

Singh Yueh	Laser induced breakdown spectroscopy for application to PPG processes	PPG Industries	Private	10,000
Fanguy Tao	Sensor for continuous monitoring of natural gas for gas pipeline corrosion prevention	US DOE	Federal	427,432
Lindner Wang	DIAL MMU support for SECARB phase II	Southern States Energy Board	Private	400,000
Norton Palmer	Reactor design and mixing of high-solids biomass slurries	US DOE NREL	Federal	15,000
Rogers	Investigation of emulsions for retarding the transport of dispersed radionuclides	WES ARMY US DOD	Federal	1,000
Lindner Palmer	Alternative sources of water for power plant use	US DOE	Federal	877,457
Lindner Monts	Improvised explosive devices neutralization and detection	Ocean Systems Engineering Group	Private	5,000
Singh Yueh	Role of inert gas with hydrogen atom in low-temperature diamond chemical vapor deposition	NSF	Federal	215,880

Table 2: Awards received between July 1, 2004 and June 30, 2005.

PIs	Title	Funding Source	Type $$	Total Amount
Giordana	On-line oxidation of volatile compounds generated by sawmill wood kilns	US DOE	Federal	21,000
Jang	Furnace fireball location system	TVA	Federal	7,000
Rogers	Investigation of emulsions for retarding the transport of dispersed radionuclides	WES ARMY US DOD	Federal	49,970
Singh	Phase detection of liquid N_2 and O_2 at high pressure and high flow using a laser raman optical fiber sensor	NASA SSC	Federal	24,000
Smith	Development and testing of unique radiation detection technology and particle size distribution	US DOE LANL	Federal	30,865
Tao Fanguy Giordana	Optical fiber chemical sensor with sol-gel derived refractive material as transducer for high temperature gas sensing in clean coal technology	US DOE	Federal	182,560
Norton Giordana	Enhancement of structural foam materials by incorporation of gasifier slag	US DOE	Federal	75,000

Table 2: Awards received between July 1, 2004 and June 30, 2005.

Giordana Han Plodinec Singh Su	Purchase of a laser ablation-inductively coupled plasma-mass spectrometer (LA-ICP-MS)	NSF	Federal	220,102
Giordana Palmer	Low temperature waste immobilization using hydro-ceramic cement	Battelle	Private	74,273
Jang	Furnace fireball location system	TVA	Federal	6,550
Plodinec	Southeastern regional carbon sequestration partnership	Southern States Energy Board	Federal	99,035
Singh Yueh	Laser induced breakdown spectroscopy for application to PPG processes	PPG Industries	Private	10,000
Giordana	On-line oxidation of volatile compounds generated by sawmill wood kilns	US DOE	Federal	40,066
Norton Palmer	Technology to support the design of a nuclear propulsion and power non-nuclear (NP2N) test facility	MRC NASA SSC	Federal	15,000
Plodinec	Accelerating cleanup of the defense nuclear legacy (cooperative agreement)	US DOE	Federal	2,976,000
Lindner Plodinec	Southeastern regional carbon sequestration partnership	Southern States Energy Board	Federal	19,992
Giordana Norton	Enhancement of structural foam materials by incorporation of gasifier slag	US DOE	Federal	50,000
Lindner Monts	Improvised explosive devices neutralization and detection	Ocean Systems Engineering Group	Private	5,050
Rogers	Investigation of emulsions for retarding the transport of dispersed radionuclides	WES ARMY US DOD	Federal	1,000
Arunkumar Singh Patterson	On-line oxidation of volatile organic compounds generated by sawmill wood kilns	US DOE	Federal	1,210,198
Singh Yueh	Non-intrusive, real time, on-line temperature sensor for superheated hydrogen at high pressure and high flow	NASA	Federal	60,000
Singh Yueh	NASA-STTR phase II	MS Ethanol	Federal/ Private	303,326

Table 3: Active Projects during the period July 1, 2004 — June 30, 2005.

PIs	Title	Funding Source	Type $$

Table 3: Active Projects during the period July 1, 2004 — June 30, 2005.

Plodinec, et al	Accelerating cleanup of the defense nuclear legacy	US DOE	Federal
Rogers Sparrow	Investigation of emulsions for retarding the transport of dispersed radionuclides	WES ARMY US DOD	Federal
Su	Long wavelength infrared (LWIR) spectral imaging system	DHS	Federal
Wang	Isoprene-OH radicals: kinetic studies of specific isomers	NSF	Federal
Palmer	On-line oxidation of volatile compounds generated by sawmill wood kilns	US DOE	Federal
Norton	Enhancements of structural foam materials by incorporation of gasifier slag	US DOE	Federal
Tao Fanguy	Optical fiber chemical sensor with sol-gel derived refractive material as transducer for high temperature gas sensing in clean coal technology	US DOE	Federal
Palmer	Low temperature waste immobilization using hydroceramic cement	Battelle	Federal/ Private
Etheridge	Gas hydrates	US DOE NETL	Federal
Wang	Ultra-sensitive elemental and isotopic measurements with plasma cavity ringdown spectroscopy	US DOE LANL	Federal
Etheridge	MS ethanol project: gasification effort	MS Ethanol	Federal/ Private
Han	Southeastern regional carbon sequestration partnership: phase I	Southern States Energy Board	Federal
Singh Yueh Khijwania	Real time non-intrusive detection of liquid nitrogen in liquid oxygen at high pressure and high flow	MS Ethanol	Federal/ Private
Singh	NASA fellowship	NASA	Federal
Singh	Non-intrusive, real time, on-line temperature sensor for superheated hydrogen at high pressure and high flow	NASA/STTR/ CAEC	Federal/ Private
Norton Palmer	Technology to support the design of a nuclear propulsion and power non-nuclear (NP2N) test facility	USM/MRC/SSC	Federal
Jang Monts Luthe	Furnace fireball location system instrument integration for one corner of the Bull Run facility furnace	TVA	Federal
Singh	Laser induced breakdown spectroscopy for application to PPG processes	PPG Industries	Private
Palmer	Purchase of a laser ablation-inductively coupled plasma-mass spectrometer	NSF	Federal
Smith	Development and testing of unique radiation detection technology and particle size distribution	US DOE LANL	Federal

Table 3: Active Projects during the period July 1, 2004 — June 30, 2005.

Waggoner	American Trucking Association project - exercises Task 4.2	ATA	Private
Waggoner	American Trucking Association project - mobilization planning Task 4.2	ATA	Private
Singh	LSBI	Malkin Estate	Private

STUDENT INVOLVEMENT

Undergraduate Level

Brian Nagel (Dr. Waggoner), Mechanical Engineering

Krystal R. Smith (Dr. Han), Chemistry

Chris Williams (Dr. Palmer, Kauffman), Civil Engineering

Dharmendra Kumar Singh (Dr. Su), Mathematics and Statistics

Masters Level

Kristina Hogancamp, Chemical Engineering

Xuemei Hu (Dr. Tao), Chemistry

Ashwiny Jayapoakask (Dr. Tao), Physics

Mi Hee Jung (Dr. Lindner), Chemical Engineering

Brian Kauffman, Chemical Engineering

Anirudha Marwaha (Drs. Palmer, Bricka), Chemical Engineering

Armstrong Mbi (Dr. Wang), Physics

Vijaykumar Rajaram (Dr. Su), Physics

T. V. S. Sarma (Dr. Tao), Physics

Doctoral Level

Joseph Fanguy, Chemical Engineering

Chan Kyu Kim (Dr. Singh), Physics

Xiaoyong Li (Dr. Su), Electrical Engineering

Seong Hong Oh (Dr. Singh), Physics

Michael Okhuysen (Dr. Monts), Engineering Physics

Larry Pearson, Chemical Engineering

Susan Scherrer (Dr. Wang), Chemistry

Safwan Shiyab (Drs. Han, Su), Plant and Soil Science

Balaji Bhaskar Maruthi Sridhar (Dr. Su), Forest Products

Vidhu Tiwai (Dr. Singh), Physics

Guangium Wang (Drs. Monts, Su), Engineering Physics

Hongbo Zheng (Dr. Singh), Physics

RESEARCH SCIENTISTS

Internal

16 Ph.D.-level scientists and engineers

18 Masters-level scientists, engineers and support staff

Other Departments

Dr. Hamid Borazjani, Forest Products

Dr. Mark Bricka, Chemical Engineering

Dr. Shane Burgess, CVM

Dr. Yul Chu, Electrical and Computer Engineering

Dr. Susan Diehl, Forest Products

Dr. San Fernando, Agriculture and Biological Engineering

Dr. David L. Monts, Physics

Dr. Rudy Rogers, Chemical Engineering

Dr. Peter Ryan, Animal and Dairy Science

Dr. Phil Steele, Forest Products

Dr. Chun Fu Su, Physics

Dr. Rebecca Toghiani, Chemical Engineering

Dr. Scott Willard, Animal and Dairy Science

MAJOR AWARDS OR RECOGNITIONS

Dr. F. X. Han was named to the editorial boards of two prestigious international journals on environmental science: Water, Air and Soil Pollution (Springer) and Water, Air and Soil, Focus (Springer).

Dr. F. X. Han serves as co-chair of the Environmental Working Group, Bagley College of Engineering, Mississippi State University.

Dr. Ron Palmer was named to the Academy of Fellows, Bagley College of Engineering, Mississippi State University.

Dr. Ron Palmer was the invited speaker at the Semi-annual Research Meeting and 20th Anniversary Celebration of the NSF Industry-University Center for Glass Research at Alfred University, June 2005.

Dr. M. J. Plodinec was named to the Academy of Fellows, Bagley College of Engineering, Mississippi State University.

Dr. Shiquan Tao authored a chapter in the first encyclopedia on sensor techniques.

Dr. Charles Waggoner was named to the Academy of Fellows, Bagley College of Engineering, Mississippi State University.

PUBLICATIONS

Refereed

Jason A. Aligo, Laura Smith, Judith L. Eglin and Laura E. Pence.2005. Solution and solid-state variation of curpric phenanthroline complexes. Inorganic Chemistry 44:4001-4007.

Yixiang Duan, Susan T. Scherrer, Sudip P. Koirala, Chuji Wang and Christopher B. Winstead. March 2005. Uranium emission spectra with a low power microwave plasma source. Analytica Chimica Acta 532:47.

A. Giordana, W.G. Ramsey, T.F. Meaker, B. Kauffman, M. McCarthy, K. Guilbeau, J.D. Smith, F.S. Miller, T. Sanders, E.W. Bohannan, J. Powell, M. Reich, J. Jordan, L. Bentre, R.E. Barletta, A.A. Ramsey, G. Maise, B. Manowitz, M. Steinberg and F. Salzano. 2004. Thermal processing optimization for simulated Hanford waste glass (AZ 101). Ceramics Transactions 55:351.

K. Guilbeau, A. Giordana, W.G. Ramsey, N. Shulyak, A. Aloy and R.A. Soshnikov. July 2004. Induction melting technology. The Glass Researcher 13:3:38-40. (American Ceramic Society Bulletin 83:7).

F.X. Han, Y. Su, D.L. Monts and B.B.M. Sridhar. 2004. Distribution, transformation and bio availability of trivalent and hexavalent chromium in contaminated soil. Plant and Soil 265: 243-252.

F.X. Han, B.B.M. Sridhar, D.L. Monts and Yi Su. 2004. Phytoavailability and toxicity of trivalent and hexavalent chromium to Brassica juncea L. Czern. New Phytologist 162:2:489-499. doi: 10.1111/j.1469-8137.2004.01027.x.

F.X. Han, W.L. Kingery, H.M. Selim, P.D. Gerard, M.S. Cox and J.L. Oldham. 2004. Accumulation and solubility of arsenic in poultry wastes and waste-amended soils. The Science of the Total Environment 320:1:51-61 (doi:10.1016/S0048-9697(03)00441-8).

S.K. Khijwania, K.L. Shrinivasan and J.P. Singh. 2005. An evanescent-wave optical fiber relative humidity sensor with enhanced sensitivity. Sens. Actuators B 104:217-222.

S.K. Khijwania, K.L. Shrinivasan and J.P. Singh. 2005. Performance optimized optical fiber sensor for humidity measurement. Optics Engineering 44:034401-1-7.

Akshaya Kumar, Fang-Yu Yueh, Jagdish P. Singh and Shane Burgess. 2004. Characterization of malignant tissue cells by laser-induced breakdown spectroscopy. Applied Optics 43:28:5399.

Bansi Lal, Hongbo Zheng, Fang-Yu Yueh and Jagdish P. Singh. 2004. Parametric study of pellets for elemental analysis with laser-induced breakdown spectroscopy. Applied Optics 43:13:2792.

Bansi Lal, Hongbo Zheng, Fang-Yu Yueh and Jagdish P. Singh. June 2005. Glass-batch composition monitoring by laser induced breakdown spectroscopy; parametric study of pellets for elemental analysis with laser-induced breakdown spectroscopy. Applied Optics 44:18.

B. Lal, F.Y. Yueh and J.P. Singh. 2005. Glass-batch composition monitoring by laser -induced breakdown spectroscopy. Applied Optics 44:3368-3674.

Z.P. Li, T.L. Zhang, D.C. Li, B. Velde and F.X. Han. 2005. Changes in soil properties of paddy fields across a cultivation chronosequence in sub tropic China. Pedosphere 15:1:110-119.

B.B. Maruthi Sridhar, S.V. Diehl, F.X. Han, D.L. Monts and Y. Su. 2005. Anatomical changes due to uptake and accumulation of Zn and Cd in Indian Mustard (Brassica juncea). Environmental and Experimental Botany 54:131-141.

Yi Su, Fengxiang X. Han, B.B. Maruthi Sridhar and David L. Monts. February 2005. Phytotoxicity and phytoaccumulation of trivalent and hexavalent chromium in brake fern. Environmental Toxicology and Chemistry 24:2019-2026.

Chuji Wang and S.T. Scherrer. December 2004. Fiber optic loop ringdown for physical sensor development: pressure sensor. Applied Optics 43:35:6458-6464.

Chuji Wang, S.T. Scherrer and D. Hossaind. July 2004. Measurements of cavity ringdown spectroscopy of acetone in the UV and near-IR spectral regions: potential for development of breath analyzer. Applied Spectroscopy 58:7:784-791.

Chuji Wang. March 2005. Fiber ringdown temperature sensor. Optics Engineering 44:3.

Non-referred Publications/Presentations

R. Arunkumar, John A. Etheridge, John C. Luthe, Brian A. Nagel, Olin P. Norton, Michael S. Parsons, Donna M. Rogers, Kristina U. Hogancamp and Charles A. Waggoner. October 2004. Evaluation of emissions from HEPA filters as a function of challenge conditions. American Association for Aerosol Research, Atlanta, GA.

R. Arunkumar, John A. Etheridge, John C. Luthe, Brian A. Nagel, Olin P. Norton, Michael S. Parsons, Donna M. Rogers, Kristina U. Hogancamp and Charles A. Waggoner. October 2004. A HEPA filter/diagnostics test facility at DIAL-MSU. American Association for Aerosol Research, Atlanta, GA.

R. Arunkumar, John A. Etheridge, John C. Luthe, Brian A. Nagel, Olin P. Norton, Michael S. Parsons, Donna M. Rogers, Kristina U. Hogancamp and Charles A. Waggoner. October 2004. Design and evaluation of a large scale particle generator for DIAL HEPA filter test stand facility. American Association for Aerosol Research, Atlanta, GA.

R. Arunkumar, John A. Etheridge, Kristina U. Hogancamp, John C. Luthe, Brian A. Nagel, Olin P. Norton, Michael S. Parsons, Donna M. Rogers and Charles A. Waggoner. February 2005. Evaluation of regenerable filter media. Waste Management 2005,Tucson, AZ.

J.W. Branch, A. Kumar, F.Y. Yueh and J.P. Singh. February 2005. Laser induced breakdown spectroscopy: application to hair and nail. Pittcon 2005 (1190-1), Orlando, FL.

Pawel Cias, Chuji Wang and Theodore S. Dibble. June 2005. Detection of atmospherically relevant hydrocarbons by diode laser cavity ringdown spectroscopy. 60th International Symposium on Molecular Spectroscopy, Columbus, OH.

Adriana Giordana, Ron Palmer, Dean Patterson, Yunju Xia, Mike McCarthy, Chris Williams, Mike Henderson, Mark Bricka, Anirudha Marwaha and Tom Thomas. February 2005. Low temperature stabilization of high level calcined waste. Poster presentation at WM 05, Tucson, AZ.

F.X. Han, M.J. Plodinec, Y. Su and D.L. Monts. May 2005. Terrestrial carbon sequestration in southeast and south-central United States. Proceedings of the Fourth Annual Conference on Carbon Capture and Sequestration, Alexandria, VA.

F.X. Han, Y. Su, D.L. Monts, C. Waggoner and M.J. Plodinec. November 2004. Bio availability of mercury at DOE Oak Ridge Site. DOE Mercury Workshop, Oak Ridge, TN.

Ping-Rey Jang, Zhiling Long, Walter Okhuysen, Yi Su and David L. Monts. September 2004. DIAL's quantitative imaging effort. MSU Optics Seminar.

S.K. Khijwania, C.K. Kim and J.P. Singh. July 2004. Laser-induced fluorescence (LIF) based optical fiber sensor for in-vitro tissue diagnosis. GRC on Laser in Medicine and Biology, Kimball Union Academy, Meriden, NH.

S.K. Khijwania, C.K. Kim and J.P. Singh. October 2004. A performance optimized optical fiber bio-probe for the cancerous tissue characterization. Optics East 2004, Philadelphia, PA.

S.K. Khijwania, C.K. Kim and J.P. Singh. October 2004. Qualitative optical fiber laser induced fluorescence spectroscopy for earlier cancer diagnosis. Optics East 2004, Philadelphia, PA.

S.K. Khijwania, V. Tiwari, F.Y. Yueh and J.P. Singh. October 2004. On-line, real time monitoring of ethanol and methanol using fiber optic Raman-probe for industrial processing. Optics East 2004, Philadelphia, PA.

C.K. Kim, S.K. Khijwania and J.P. Singh. July 2004. A novel optical fiber sensor probe for biomedical applications. GRC on Laser in Medicine and Biology, Kimball Union Academy, Meriden, NH.

Chan K. Kim, Rajamohan R. Kalluru, Sunil K. Khijwania, Scott T. Willard, Peter L. Ryan, Fang Y. Yueh and Jagdish P. Singh. December 2004. Human breast cancer cell lines diagnosis using optical fiber laser-induced fluorescence (LIF) sensor. Photonics 2004: Seventh International Conference on Optoelectronics, Fiber Optics, and Photonics, Cochin, India.

S.Y. Oh, J.W. Branch, T, Miller. F.Y. Yueh and J.P. Singh. February 2005. On-line monitoring of glass melter slurry using laser induced breakdown spectroscopy. Pittcon 2005 (380-8), Orlando, FL.

R.A. Palmer and G.W. Hollenberg. April 2005. A brief history of the nuclear and environmental technology division of the American Ceramic Society. 107th Annual Meeting of the American Ceramic Society, Baltimore, MD.

R.A. Palmer, A. Giordana, D.K. Peeler and S.L. Marra. April 2005. Melt rate enhancement and improved waste loading for DWPF glasses. 107th Annual Meeting of the American Ceramic Society, Baltimore, MD.

M. John Plodinec, Ping-Rey Jang, Zhiling Long, Walter P. Okhuysen, Yi Su and David L. Monts. February 2005. Development of quantitative imaging probes for in situ volumetric determination of Hanford tank wastes. Waste Management 05 Symposium, Tucson, AZ.

Susan T. Scherrer, Chuji Wang and Christopher B. Winstead. June 2005. Near infrared measurements of volatile organic compounds using diode laser cavity ringdown spectroscopy. 60th International Symposium on Molecular Spectroscopy, Columbus, OH.

J.P. Singh. December 2004. Laser induced fluorescence (LIF) based optical fiber probe for biomedical application. Invited talk in the International Photonics 2004 SPIE Conference, Cochin, India.

J.P. Singh. December 2004. Laser based optical fiber probes for biomedical application. Invited talk at Emerging Frontier in Physical Sciences Conference at Allahabad University, Allahabad, India.

L.T. Smith, R.K. Toghiani, V. Phillips, M.H. Jung, J.C. Luthe, M. John Plodinec and J.S. Lindner. March 2005. DIAL process chemistry support. Presented at the Savannah River/Hanford Technical Exchange, WSRC-MM-2005-00044.

L.T. Smith, R.K. Toghiani, V. Phillips, M.H. Jung, J.C. Luthe, M. John Plodinec and J.S. Lindner. March 2005. Modeling and experimental support for high-level SRS salt disposition alternatives. Presented at the Savannah River/Hanford Technical Exchange, WSRC-MM-2005-00044.

L.T. Smith, R.K. Toghiani, V. Phillips, M.H. Jung, J.C. Luthe, M. John Plodinec and J.S. Lindner. March 2005. Process Chemistry Support for Hanford. Presented at the Savannah River/Hanford Technical Exchange, WSRC-MM-2005-00044.

C.A. Sparrow, D. Rogers and V.F. Medina. June 2005. Shielding of beta emissions by emulsions. Proceedings of the 2005 American Nuclear Society Meeting, San Diego, CA.

B.B. Maruthi Sridhar, F.X. Han, S.V. Diehl, D.L. Monts and Y. Su. November 2004. Effect of high soil concentrations of mercury on growth, physiology and internal structure of plants. Soil Science Society of America International Annual Meetings, Seattle, WA.

B.B. Maruthi Sridhar, F.X. Han, S.V. Diehl, D.L. Monts and Y. Su. November 2004. Discrimination of chromium phytotoxicity to plants using hyper spectral reflectance. Soil Science Society of America International Annual Meetings, Seattle, WA.

Y. Su, F.X. Han, D.L. Monts, C. Waggoner and M.J. Plodinec. November 2004. Phytoremediation of mercury contaminated DOE Oak Ridge Site. DOE Mercury Workshop, Oak Ridge, TN.

Yi Su, Fengxiang X. Han, B.B. Maruthi Sridhar, Susan V. Diehl and David L. Monts. November 2004. Bio availability, toxicity and phytoextraction of trivalent and hexavalent chromium in contaminated soils. Second International Conference on Soil Remediation (SOILREM 2004), Nanjing, People's Republic of China.

Yi Su, Fengxiang Han, David L. Monts, Charles A. Waggoner and M. John Plodinec. February 2005. Bio-availability and speciation of mercury in soils from Oak Ridge, TN. Waste Management 05 Symposium, Tucson, AZ.

Yun Sun, Zhiling Long, Ping-Rey Jang and M. John Plodinec. October 2004. Gabor wavelet image analysis for soil texture classification. Optics East 2004, Philadelphia, PA.

Shiquan Tao, Joseph C. Fanguy, Xiemei Hu and Qiangu Yan. May 2005. Fiber optic sensor for in situ real time monitoring PEM fuel cell operation. Proceedings of Fuel Cell 2005 (Third International Conference on Fuel Cell Science, Engineering and Technology), Ypsilanti, MI.

S. Tao, J.C. Fanguy, L. Xu and A. Giordana. November 2004. Sol-gel derived porous silica as a constituent material for designing optical fiber chemical sensor. Proceedings of 2004 MRS Fall Meeting, Boston, MA.

V.S. Tiwari, R.R. Kalluru, F.Y. Yueh and J.P. Singh. June 2005. Measurement of liquid nitrogen in a liquid oxygen feed line during rocket engine testing. AIAA-2005-5274, 35th AIAA Fluid Dynamics Conference and Exhibit, Toronto, Canada.

V.S. Tiwari, S.K. Khijwania, F.Y. Yueh, J.P. Singh and R.R. Kalluru. February 2005. Optical fiber Raman sensor for concentration ratio measurement of N_2 and O_2 in a high-pressure gas mixture. Pittcon 2005(2250-10), Orlando, FL.

V.S. Tiwari, S.K. Khijwania, F.Y. Yueh and J.P. Singh. December 2004. Monitoring N_2 and O_2 concentration ratio in a high-pressure gas mixture by fiber optic Raman sensor. Seventh International Conference on Optoelectronics, Fiber and Photonics, SPIE Photonics-2004 (FBR P35-1).

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