Front Matter: Volume 8351
Third Asia Pacific Optical Sensors Conference

John Canning
Gang-Ding Peng
Editors

31 January–3 February 2012
Sydney, Australia

Organised by
Interdisciplinary Photonics Laboratories, The University of Sydney
Photonics and Optical Communications, The University of New South Wales

Sponsored by
Engineers Australia (Australia)

Cooperating Organisations
SPIE
Optical Society of America
IEEE NSW
IEEE Photonics Society
AusBiotech (Australia)

Volume 8351
Part One of Two Parts

Proceedings of SPIE, 0277-786X, v. 8351

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.
Contents

Part One

  xvii Conference Committee
  xxi Introduction

PHYSICAL SENSING

8351 02 Applications of advanced optical fiber sensors at UESTC (Plenary Paper) [8351-164]
Y.-J. Rao, Univ. of Electronic Science and Technology (China)

8351 03 Field demonstration of 10-nano static strain resolution multiplexed FBG sensor for
gеophysical applications [8351-143]
Q. Liu, T. Tokunaga, K. Mogi, The Univ. of Tokyo (Japan); H. Matsui, Japan Atomic Energy
Agency (Japan); H. F. Wang, Univ. of Wisconsin-Madison (United States); T. Kato, Z. He, The
Univ. of Tokyo (Japan)

8351 04 Fiber laser hydrophone for low frequency signal detection [8351-12]
W. Zhang, F. Li, Y. Liu, Institute of Semiconductors (China)

8351 05 Digital resonator fiber optic gyro based on a miniature laser source [8351-31]
H. Ma, X. Yu, Z. Jin, Zhejiang Univ. (China)

8351 06 Hydrostatic pressure sensing using a polymer optical fibre Bragg gratings [8351-74]
I. P. Johnson, D. J. Webb, Aston Univ. (United Kingdom); K. Kalli, Cyprus Univ. of Technology
(Cyprus)

8351 07 Tunable Yagi-Uda-type plasmonic nanoantennas: implications for nanoscale optical
sensing [8351-39]
I. S. Maksymov, A. E. Miroshnichenko, Y. S. Kivshar, Australian National Univ. (Australia)

8351 08 Refractive index sensing by a periodical pressure on a single-mode fiber [8351-06]
X. Zhou, S. Shi, Z. Zhang, X. Li, Y. Liu, Univ. of Electronic Science and Technology of China
(China)

8351 09 Fiber optic sensor for detection of ground vibrations [8351-33]
T.-C. Liang, Y.-L. Lin, National Kaohsiung First Univ. of Science and Technology (Taiwan,
China)

8351 0A Design and fabrication of a debris flow sensor using a fiber optic interferometer [8351-34]
Y.-L. Lin, T.-C. Liang, National Kaohsiung First Univ. of Science and Technology (Taiwan,
China)

8351 0B Sensor-less aberration correction in optical imaging systems using blind optimization
[8351-42]
M. R. N. Avanaki, Univ. of Kent (United Kingdom); R. Mazraeh Khoshti, Univ. of Razi (Iran,
Islamic Republic of); S. A. Hojjatoleslami, A. Gh. Podoleanu, Univ. of Kent (United Kingdom)
8351 0C  Low coherence interferometry modelling using combined broadband Gaussian light sources [8351-162]
P. Jansz, G. Wild, S. Richardson, S. Hinckley, Edith Cowan Univ. (Australia)

8351 0D  A high temperature sensor based on a peanut structure-based Michelson interferometer [8351-60]
T. Zhu, D. Wu, D.-W. Duan, Chongqing Univ. (China); K. Chiang, City Univ. of Hong Kong (Hong Kong, China) and Chongqing Univ. (China); Y.-J. Rao, Univ. of Electronic Science and Technology of China (China) and Chongqing Univ. (China)

8351 0E  The dual-parameter sensor based on the SMS fiber structure with an off-axis welding [8351-90]
Y. Liu, S. Peng, B. Li, J. Zhang, Harbin Engineering Univ. (China)

8351 0F  Fiber optical vibrometer based on a phononic crystal filter [8351-95]
S. Lin, Q. Chai, J. Zhang, Harbin Engineering Univ. (China)

8351 0G  Wavelet transform based de-noising method for self-mixing interferometry signals [8351-130]
Y. Sun, Y. Yu, J. Xi, Univ. of Wollongong (Australia)

8351 0H  Sensitivity of cavity optomechanical field sensors (Invited Paper) [8351-177]
J. Knittel, The Univ. of Queensland (Australia); S. Forstner, The Univ. of Queensland (Australia) and TU München (Germany); J. D. Swaim, H. Rubinsztein-Dunlop, W. P. Bowen, The Univ. of Queensland (Australia)

OPTICAL FIBRES AND SENSING

8351 0I  Smart aircraft composite structures with embedded small-diameter optical fiber sensors (Invited Paper) [8351-89]
N. Takeda, S. Minakuchi, The Univ. of Tokyo (Japan)

8351 0J  Influence of core diameter and length of polymer optical fiber on Brillouin scattering properties [8351-166]
Y. Mizuno, Tokyo Institute of Technology (Japan); T. Ishigure, Keio Univ. (Japan); K. Nakamura, Tokyo Institute of Technology (Japan)

8351 0K  Fiber ring laser incorporating a pair of rotary long-period fiber gratings for torsion measurement [8351-61]
L. Shi, T. Zhu, F. Chen, Chongqing Univ. (China); K. Chiang, City Univ. of Hong Kong (Hong Kong, China) and Chongqing Univ. (China); Y. Rao, Univ. of Electronic Science & Technology of China (China)

8351 0L  Cryogenic temperature response of long-period fiber gratings inscribed on standard photosensitive single-mode fibers [8351-46]
D. Choi, J. Kim, Y. W. Lee, Pukyong National Univ. (Korea, Republic of)
<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>8351 0M</td>
<td>High-sensitivity stress sensor based on Bragg grating in BDK-doped photosensitive polymer optical fiber [8351-09]</td>
<td>T. Wang, Univ. of Science and Technology of China (China); Y. Luo, Univ. of Science and Technology of China (China) and The Univ. of New South Wales (Australia); G.-D. Peng, The Univ. of New South Wales (Australia); Q. Zhang, Univ. of Science and Technology of China (China)</td>
</tr>
<tr>
<td>8351 0N</td>
<td>In-ground optical fibre Bragg grating pressure switch for security applications [8351-78]</td>
<td>G. Allwood, G. Wild, S. Hinckley, Edith Cowan Univ. (Australia)</td>
</tr>
<tr>
<td>8351 0O</td>
<td>Birefringence analysis of a two elliptical cores hollow fiber based on finite element method [8351-55]</td>
<td>F. Tian, L. Yuan, Q. Dai, Z. Liu, J. Zhang, Harbin Engineering Univ. (China)</td>
</tr>
<tr>
<td>8351 0Q</td>
<td>Implementation of highly sensitive refractometers with rectangular microfibers [8351-101]</td>
<td>J. Li, L.-P. Sun, S. Gao, Z. Quan, Y.-L. Chang, Y. Ran, L. Jin, B.-O. Guan, Jinan Univ. (China)</td>
</tr>
<tr>
<td>8351 0R</td>
<td>Optical humidity sensor based on hollow core fiber [8351-103]</td>
<td>M. Y. Mohd Noor, N. Khalili, G. D. Peng, The Univ. of New South Wales (Australia)</td>
</tr>
<tr>
<td>8351 0S</td>
<td>Enhanced working distance of fiber lens with low refractive index material [8351-105]</td>
<td>J. Lee, Korea Polytechnic Univ. (Korea, Republic of)</td>
</tr>
<tr>
<td>8351 0T</td>
<td>Double-fiber Fabry-Perot Interferometry optical fiber liquid level sensor [8351-119]</td>
<td>B. Tong, M. Li, Wuhan Univ. of Technology (China); Y. Li, Wuhan Haomai Photonics Technology Co., Ltd. (China)</td>
</tr>
</tbody>
</table>

**Integrated Technologies for Sensing**

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>8351 0U</td>
<td>Low-cost fully integrated fiber Bragg grating interrogation system [8351-54]</td>
<td>B. Van Hoe, E. Bosman, J. Missinne, S. Kalathimekkad, Imec, Ghent Univ. (Belgium); G. Lee, Z. Yan, K. Sugden, D. J. Webb, Aston Univ. (United Kingdom); G. Van Steenberge, P. Van Daele, Imec, Ghent Univ. (Belgium)</td>
</tr>
<tr>
<td>8351 0V</td>
<td>Tubular optical waveguide-based particle plasmon resonance biosensor for label-free and real-time detection [8351-65]</td>
<td>H.-Y. Lin, C.-H. Huang, Y.-C. Liu, S.-H. Chen, L.-K. Chau, National Chung Cheng Univ. (Taiwan, China)</td>
</tr>
<tr>
<td>8351 0W</td>
<td>High speed random accessibility of Brillouin optical correlation domain analysis with time division pump-probe generation scheme [8351-99]</td>
<td>K. Hotate, M. Numasawa, M. Kishi, Z. He, The Univ. of Tokyo (Japan)</td>
</tr>
<tr>
<td>8351 0X</td>
<td>Generating and sensing signals for quantum cryptography using phase encoding in compact silica-on-silicon Mach-Zehnder circuits with Bragg gratings [8351-59]</td>
<td>M. Kristensen, T. Balle, J. Selchau, K. B. Sigvardt, N. Groothoff, Aarhus Univ. (Denmark)</td>
</tr>
</tbody>
</table>
**Integrated interferometer for measuring three-dimensional vibrations based on spherical cooperative target** [8351-72]
X. Zhang, D. Liu, T. Feng, F. Liu, J. Miao, J. Zhu, Shanghai Institute of Optics and Fine Mechanics (China)

**Optical methane detection sensor using an interferometric-structured optical planar waveguide** [8351-122]
M. J. Kim, S. H. Hwang, W.-J. Lee, E. J. Jung, B. S. Rho, Korea Photonics Technology Institute (Korea, Republic of)

**GRATING AND COMPONENT TECHNOLOGIES FOR SENSING**

**Full-spectrum FBG analysis of inhomogeneous, fast-varying strain effects (Invited Paper)** [8351-159]
K. Peters, North Carolina State Univ. (United States)

**Regenerated femtosecond fibre Bragg gratings** [8351-127]
K. Cook, The Univ. of Sydney (Australia); C. Smelser, Communications Research Ctr. Canada (Canada); J. Canning, The Univ. of Sydney (Australia); G. le Garff, M. Lancry, Univ. Paris Sud 11 (France); S. Mihailov, Communications Research Ctr. Canada (Canada)

**Tailored draw tower fiber Bragg gratings for various sensing applications** [8351-22]
E. Lindner, Institut für Photonische Technologien e.V. (Germany) and FBGS Technologies GmbH (Germany); J. Mörbitz, C. Chojetzki, FBGS Technologies GmbH (Germany); M. Becker, S. Brückner, K. Schuster, M. Rothhardt, R. Wilsch, H. Bartelt, Institut für Photonische Technologien e.V. (Germany)

**Microfiber Bragg grating inscribed using 193nm excimer laser for refractive index sensing** [8351-115]
Y. Ran, L.-P. Sun, S. Gao, Z. Quan, J. Li, L. Jin, B.-O. Guan, Jinan Univ. (China)

**Modeling of bend effects on fiber Bragg gratings** [8351-129]
P. J. Cadusch, A. C. Thompson, P. R. Stoddart, S. A. Wade, Swinburne Univ. of Technology (Australia)

**Noise analysis in a fiber Bragg grating accelerometer using Allan Variance Method** [8351-100]
M. M. Carvalho, R. M. Cazo, Instituto de Estudos Avançados (Brazil)

**Bend response of weakly tilted Bragg grating inscribed in all-solid photonic band-gap fibers** [8351-10]
Y. Miao, Tianjin Univ. of Technology (China); B. Liu, Nankai Univ. (China); K. Zhang, X. Zhu, Tianjin Univ. of Technology (China); Y. Liu, X. Chen, H. Zhang, Nankai Univ. (China)

**Regenerated single pulse fiber Bragg gratings for high temperature sensing** [8351-21]
E. Lindner, Institut für Photonische Technologien e.V. (Germany) and FBGS Technologies GmbH (Germany); C. Chojetzki, J. Mörlitzy, FBGS Technologies GmbH (Germany); S. Brückner, M. Becker, M. Rothhardt, H. Bartelt, Institut für Photonische Technologien e.V. (Germany)
8351 18  **Refractive-index gradient sensor based on the structured fiber Bragg grating** [8351-23]
B. Luo, Chongqing Univ. of Technology (China) and Univ. of Electronic Science and Technology of China (China); M. Zhao, Chongqing Univ. of Technology (China); X. Zhou, S. Shi, Univ. of Electronic Science and Technology of China (China); X. Han, Y. Wang, Chongqing Univ. of Technology (China)

8351 19  **Analysis and study of static pressure distribution in an optical cable spool using distributed fiber Bragg gratings** [8351-27]
L. Ren, Xi'an Institute of Optics and Precision Mechanics (China); C. Ma, Xi'an Institute of Optics and Precision Mechanics (China) and Xi'an Shiyou Univ. (China); F. Tang, Xi'an Institute of Modern Control Technology (China); E. Qu, X. Han, Xi'an Institute of Optics and Precision Mechanics (China)

8351 1A  **Side-polished fiber Bragg grating hydrogen sensor with different sensitive thin films** [8351-32]
M. Yang, J. Dai, Wuhan Univ. of Technology (China); K. Cao, J. Liao, P. Zhang, China Academy Engineering Physics (China)

8351 1B  **Enhancing the temperature sensitivity of fiber Bragg grating sensor using bimetallic strip** [8351-38]

8351 1C  **Photonic crystal surface plasmon waveguides sensor for high and accurate temperature measurement** [8351-44]
R. Jha, Indian Institute of Technology Bhubaneswar (India); T. Srivastava, Delhi Technological Univ. (India); R. Das, National Institute of Science Education and Research (India)

8351 1D  **A high sensitive fiber Bragg grating (FBG) geophone detecting system** [8351-49]
J.-Y. Wang, H.-F. Qi, G.-D. Song, C. Wang, Key Lab. of Optical Fiber Sensoring Technology of Shandong Province (China) and Shandong Academy of Sciences (China); T.-Y. Liu, Key Lab. of Optical Fiber Sensoring Technology of Shandong Province (China) and Shandong Academy of Sciences (China) and Shandong Micro-Sensor Photonics Ltd. (China)

8351 1E  **Online fabrication of compact and asymmetrical DFB fiber laser** [8351-63]
H. Qi, Shandong Academy of Sciences (China) and The Univ. of New South Wales (China); Z. Song, C. Wang, J. Chang, Shandong Academy of Sciences (China); G. Peng, The Univ. of New South Wales (China)

8351 1F  **Interrogation of intensity modulation fiber Bragg grating sensor based on loss-tunable corrugated long period fiber grating filter** [8351-70]
C.-C. Chiang, M.-Y. Hsieh, National Kaohsiung Univ. of Applied Sciences (Taiwan, China)

8351 1G  **Study of DFB fiber laser intensity noise and its suppression** [8351-73]
Y. Zhao, C. Wang, J. Ni, Shandong Academy of Science (China); J. Chang, P. Wang, Shandong Univ. (China); G. Peng, The Univ. of New South Wales (China); T. Liu, Shandong Academy of Science (China); Q. Wang, Shandong Univ. (China)
CO₂-laser induced long-period fiber gratings in nano-engineered bend insensitive single-mode fiber [8351-148]
Y. Rao, W. Wang, Z. Wang, K. S. Chiang, Y. Gong, Univ. of Electronic Science & Technology of China (China)

Experimental and technical research on fiber Bragg grating vibration measuring based on two matching gratings demodulation [8351-154]
Z. Wang, Q. Sui, J. Wang, J. Chang, Shandong Univ. (China); G. Peng, The Univ. of New South Wales (Australia); H. Song, Shandong Univ. (China)

Michelson Interferometer characterisation of noise reduction in DFB fibre lasers [8351-132]
A. Canagasabey, The Univ. of Sydney (Australia); D. Jones, D. Mann, Thales Underwater Systems (Australia); J. Canning, S. Fleming, The Univ. of Sydney (Australia); J. Holdsworth, Univ. of Newcastle (Australia)

The weak optical feedback effect of DFB fiber laser and its sensing applications [8351-93]
Y. Zhao, T. Amine, J. Zhang, Harbin Engineering Univ. (China); G. D. Peng, The Univ. of New South Wales (Australia)

Narrow-linewidth photonic crystal fiber laser with DBR construction [8351-123]
X. Liu, W. Bi, X. Liu, F. Wang, Y. Qi, C. Hou, Yanshan Univ. (China)

High strain FBG sensors for structural fatigue testing of military aircraft [8351-126]
S. Tejedor, J. Kopczyk, T. Nuyens, C. Davis, Defence Science and Technology Organisation (Australia)

Liquid level measurement sensor using a long-period fiber grating [8351-116]
B.-M. Mao, B. Zhou, Zhejiang Univ. (China)

Application of fiber grating-based acoustic sensor in progressive failure testing of e-glass/vinylester curve composites [8351-120]
A. I. Azmi, Raju, G.-D. Peng, The Univ. of New South Wales (Australia)

CHEMICAL AND ENVIRONMENTAL SENSING

Plasmonic-photonic resonances in nanostructured metallo-dielectric quasi-crystals: tuning and sensitivity analysis [8351-17]
A. Ricciardi, A. Crescitelli, M. Consales, V. Galdi, Univ. degli Studi del Sannio (Italy); E. Esposito, Instituto di Cibernetica (Italy); A. Cusano, Univ. degli Studi del Sannio (Italy)

A microstructured optical fiber sensor for ion-sensing based on the photoinduced electron transfer effect [8351-144]
A. C. Richardson, T. C. Foo, F. V. Englich, H. Ebendorff-Heidepriem, C. J. Sumby, T. M. Monro, The Univ. of Adelaide (Australia)

Edge gold-coated silver nanoprism [Ag@Au nanoframe] for H₂O₂ detection [8351-179]
M. M. Shahjamali, Nanyang Technological Univ. (Singapore); E. Martinsson, Linkoping Univ. (Sweden); W. Marcella, L. Yin, Nanyang Technological Univ. (Singapore); B. Liedberg, Linkoping Univ. (Sweden); F. Boey, C. Xue, Nanyang Technological Univ. (Singapore)
Additional enhancement in surface-enhanced Raman scattering due to excitation geometry [8351-147]
L. Rosa, S. Jayawardhana, Swinburne Univ. of Technology (Australia); S. Juodkazis, Swinburne Univ. of Technology (Australia) and Melbourne Ctr. for Nanofabrication (Australia); P. R. Stoddart, Swinburne Univ. of Technology (Australia)

Fiber optic hydrogen gas sensor utilizing surface plasmon resonance of indium-tin oxide (ITO) thin films [8351-80]
S. K. Mishra, B. D. Gupta, Indian Institute of Technology Delhi (India)

Surface plasmon resonance based fiber optic hydrogen sensor utilizing wavelength interrogation (Invited Paper) [8351-37]
P. Bhatia, B. D. Gupta, Indian Institute of Technology Delhi (India)

Sensitivity investigation of intra-cavity absorption gas sensors based on erbium-doped fiber ring lasers [8351-165]
T. Liu, K. Liu, J. Jiang, Y. Zhang, Tianjin Univ. (China) and Ministry of Education (China)

Fiber Laser methane sensor with the function of self-diagnose [8351-58]
Y. Li, Y. Wei, Y. Shang, C. Wang, T. Liu, Shandong Key Lab. of Optical Fiber Sensor (China) and Shandong Academy of Sciences (China)

Modeling and experimental investigation of the coupling efficient of a fiber-capillary fluorescent sensor [8351-53]
Z. Pan, M. Li, L. Hua, Wuhan Univ. of Technology (China); Y. Li, Wuhan Haomai Photonics Technology Co., ltd. (China)

Surface plasmon resonance based fiber optic glucose biosensor [8351-155]
S. K. Srivastava, R. Verma, B. D. Gupta, Indian Institute of Technology Delhi (India)

A sensitivity enhanced gas sensor based on carbon nanotubes around microfiber [8351-161]
L. Jia, Y. Wu, B. Yao, F. Yang, Y. Rao, Univ. of Electronic Science and Technology (China)

Gas detection with evanescent-wave quartz-enhanced photoacoustic spectroscopy [8351-96]
Y. Cao, W. Jin, H. L. Ho, The Hong Kong Polytechnic Univ. (Hong Kong, China)

Study of photorefractive properties of liquid crystal hybrid thin film by side polished fiber sensor [8351-67]
J. Yu, X. Li, Y. Du, J. Zhang, Z. Chen, Jinan Univ. (China)

FBG application in monitoring the liquid-solid and gas-liquid phase transitions of water [8351-82]
C. Quan, K. Later, L. Yang, S. Peng, A. Zhang, Q. Hao, J. Zhang, W. Sun, L. Yuan, Harbin Engineering Univ. (China); G. D. Peng, The Univ. of New South Wales (Australia)

Research of fiber carbon dioxide sensing system based laser absorption spectrum [8351-71]
Y. Wei, T. Zhang, Y. Li, Y. Zhao, C. Wang, T. Liu, Shandong Academy of Sciences (China)
Water vapor absorption spectrum measurements and its application in concentration measurement [8351-133]
J. Chang, Shandong Univ. (China); K. Chen, School of CPC Shandong Provincial Party Committee, Jinan (China); G. Zhou, G. Lv, C. Zhu, Z. Wang, F. Song, H. Song, J. Tian, W. Hou, J. Huang, Shandong Univ. (China)

Performance investigation of erbium-doped fiber ring laser for intra-cavity absorption gas detection [8351-98]
M. Li, The Univ. of New South Wales (Australia) and Harbin Institute of Technology (China); J. Dai, Harbin Institute of Technology (China); K. Liu, The Univ. of New South Wales (Australia) and Tianjin Univ. (China); G.-D. Peng, The Univ. of New South Wales (Australia)

Periodic array of nanoholes on gold-coated optical fiber end-faces for surface plasmon resonance liquid refractive index sensing [8351-128]
H. Nguyen, F. Sidiropoulou, S. F. Collins, G. W. Baxter, Victoria Univ. (Australia); A. Roberts, The Univ. of Melbourne (Australia); T. J. Davis, Commonwealth Scientific and Industrial Research Organisation (Australia)

NOVEL MATERIALS FOR SENSING

Fabrication of self-assembled microwires from silica nanoparticles for sensing [8351-124]
M. Naqshbandi, J. Canning, M. J. Crossley, The Univ. of Sydney (Australia)

Fabrication of 2D metal nanoparticle array encapsulated by anodic aluminum oxide and its applications to surface-enhanced Raman scattering [8351-136]
C.-H. Huang, H.-Y. Lin, National Chung Cheng Univ. (Taiwan, China)

Green fluorescent protein-doped sol-gel silica planar waveguide to detect organophosphorus compound [8351-75]
Y. Enami, Hiroshima Univ. (Japan); S. Suye, Univ. of Fukui (Japan)

Surface plasmon resonance based multi-channel and multi-analyte fiber optic sensor [8351-85]
R. Verma, S. K. Srivastava, B. D. Gupta, Indian Institute of Technology Delhi (India)

Measurement of Rhodamine B absorption in self-assembled silica microwires using a Tablet as the optical source [8351-40]
J. Canning, M. Naqshbandi, M. J. Crossley, The Univ. of Sydney (Australia)

Four-layer d-shaped optical fiber surface plasmon resonance sensor for high-sensitivity strain measurement [8351-41]

Optically stimulated luminescence in fluoride phosphate glass optical fibres for radiation dosimetry [8351-170]
C. A. G. Kalnins, H. Ebendorff-Heidepriem, Univ. of Adelaide (Australia); N. A. Spooner, Univ. of Adelaide (Australia) and Defence Science and Technology Organisation (Australia); T. M. Monro, Univ. of Adelaide (Australia)
8351 2H Surface plasmon resonance based fiber optic refractive index sensor utilizing cobalt metal [8351-171]
S. Singh, B. D. Gupta, Indian Institute of Technology Delhi (India)

8351 2I Surface-enhanced Raman spectroscopy of mouse serum using silver colloid substrate [8351-156]
S. Liu, H. Zhu, S. Chen, Z. Chen, N. Chen, T. Wang, Shanghai Univ. (China)

8351 2K MFI-type zeolite functional liquid phase sensor coated on the optical fiber end-face [8351-131]
Y. Hu, F. Sidiropoulou, Victoria Univ. (Australia); M. R. Hill, Commonwealth Scientific and Industrial Research Organization (Australia); S. F. Collins, M. Duke, Victoria Univ. (Australia)

8351 2M New theory of femtosecond induced changes and nanopore formation [8351-106]
J. Canning, The Univ. of Sydney (Australia); M. Lancry, Univ. Paris Sud 11 (France); K. Cook, The Univ. of Sydney (Australia); B. Poumellec, Univ. Paris Sud 11 (France)

8351 2N Surface treatment of silicate based glass: base Piranha treatment versus 193nm laser processing [8351-107]
J. Canning, I. Petermann, K. Cook, The Univ. of Sydney (Australia)

8351 2O Sol-gel surface functionalisation by cold-processing for optical sensor applications [8351-134]
G. Huyang, I. Petermann, J. Canning, M. J. Crossley, The Univ. of Sydney (Australia)

BIOLOGICAL AND BIOMEDICAL SENSING AND IMAGING

8351 2P Plasmonic field enhancement and hot spot generation for sensor applications (Invited Paper) [8351-167]

8351 2Q Lanthanide upconversion nanocrystals within microstructured optical fibres; a sensitive platform for biosensing and a new tool for nanocrystal characterisation [8351-151]
E. P. Schartner, The Univ. of Adelaide (Australia); D. Jin, Macquarie Univ. (Australia); H. Ebendorff-Heidepriem, The Univ. of Adelaide (Australia); J. A. Piper, Macquarie Univ. (Australia); T. M. Monro, The Univ. of Adelaide (Australia)

8351 2R Real-time detection of α-thrombin binding to single-strand DNA aptamers by a highly sensitive Si-based waveguide SPR biosensor [8351-135]
C.-C. Huang, H.-F. Hsu, S.-H. Chen, K.-Y. Tsai, Y.-T. Huang, C.-S. Lin, S.-H. Hsu, National Chiao Tung Univ. (Taiwan, China)

8351 2S Multiplex fiber-optic biosensor using multiple particle plasmon resonances [8351-69]
H.-Y. Lin, C.-H. Huang, Y.-C. Liu, K.-W. Huang, L.-K. Chau, National Chung Cheng Univ. (Taiwan, China)

8351 2T On-chip SERS analysis for single mimic pathogen detection using Raman-labeled nanoaggregate-embedded beads with a dielectrophoretic chip [8351-79]
Optical-fiber biosensors using plasmons excited tilted fiber gratings [8351-102]
T. Guo, B. Guan, Jinan Univ. (China); Y. Y. Shevchenko, J. Albert, Carleton Univ. (Canada)

Raman spectroscopy is a novel tool for bacteria fingerprint discrimination: preparation a disk-like SERS substrate [8351-08]
C. C. Lin, Tunghai Univ. (Taiwan, China)

Dynamic digital holography applied to three-dimensional imaging of droplet evaporation process [8351-48]
S. Li, J. Zhong, J. Weng, C. Hu, Jinan Univ. (China)

A new real non-invasive single fiber tweezers [8351-97]
Y. Zhang, Z. Liu, J. Yang, L. Yuan, Harbin Engineering Univ. (China)

The non-uniformity and dispersion in SBS-based fiber sensors (Plenary Paper) [8351-169]
X. Bao, S. Xie, X. Liu, L. Chen, Univ. of Ottawa (Canada)

External feedback DFB fibre laser sensors in the weak reflection regime [8351-163]
S. Foster, Defence Science and Technology Organisation (Australia)

Fast and distributed dynamic sensing of strain using Sweep-Free Brillouin Optical Time-Domain analysis (SF-BOTDA) [8351-62]
A. Voskoboinik, The Univ. of Southern California (United States); Y. Peled, Tel Aviv Univ. (Israel); A. E. Willner, The Univ. of Southern California (United States); M. Tur, Tel Aviv Univ. (Israel)

Distributed fiber optic sensor for mapping of intense magnetic fields based on polarization sensitive reflectometry [8351-149]
L. Palmieri, A. Galtarossa, Univ. degli Studi di Padova (Italy)

BOTDA measurements in the presence of fiber vibrations [8351-140]
A. Motil, Y. Peled, L. Yaron, M. Tur, Tel Aviv Univ. (Israel)

Strain and temperature discrimination using concatenated fiber grating lasers [8351-108]
Y.-N. Tan, Dalian Univ. of Technology (China) and Jinan Univ. (China); Y. Zhang, Dalian Univ. of Technology (China); L. Jin, B.-O. Guan, Jinan Univ. (China)

A cost effective FBG-based security fence with fire alarm function [8351-35]
H. J. Wu, S. S. Li, X. L. Lu, Y. Wu, Y. J. Rao, Univ. of Electronic Science and Technology of China (China)

Non-local effect in long-distance Brillouin optical time-domain analyzer based on bi-directional Raman amplification [8351-36]
X.-H. Jia, Y.-J. Rao, Univ. of Electronic Science & Technology of China (China)

1-cm spatial resolution with large dynamic range in strain distributed sensing by Brillouin optical correlation domain reflectometry based on intensity modulation [8351-51]
S. Manotham, M. Kishi, Z. He, K. Hotate, The Univ. of Tokyo (Japan)
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>8351 37</td>
<td>Fiber optical sensors in power generation (Invited Paper) [8351-174]</td>
<td>M. Willsch, Siemens AG (Germany)</td>
</tr>
<tr>
<td>8351 38</td>
<td>Progressive failure monitoring of E-glass/vinylester curve composites using embedded FBG sensors [8351-84]</td>
<td>A. I. Azmi, R. Raju, G.-D. Peng, The Univ. of New South Wales (Australia)</td>
</tr>
<tr>
<td>8351 39</td>
<td>Development and application of subminiature multipoint FBG displacement sensor [8351-153]</td>
<td>J. Wang, Q. Sui, Z. Wang, J. Chang, Shandong Univ. (China); G. Peng, The Univ. of New South Wales (Australia); J. Tian, Shandong Univ. (China)</td>
</tr>
<tr>
<td>8351 3A</td>
<td>Experience of developments and applications of intelligent optical fiber sensors in industries of Russia [8351-18]</td>
<td>G. Y. Buymistryuk, Intel-Systems Instruments Ltd. (Russian Federation)</td>
</tr>
<tr>
<td>8351 3B</td>
<td>Use of FBG sensors in SHM of aerospace structures [8351-168]</td>
<td>G. C. Kahandawa, J. Epaarachchi, H. Wang, Univ. of Southern Queensland (Australia)</td>
</tr>
<tr>
<td>8351 3C</td>
<td>A calibration method based on look-up-table for cryogenic temperature fiber Bragg grating sensors [8351-117]</td>
<td>A. Saccomanno, Univ. degli Studi di Napoli Federico II (Italy); G. Breglio, Univ. degli Studi di Napoli Federico II (Italy) and Optosmart s.r.l. (Italy); A. Irace, Univ. degli Studi di Napoli Federico II (Italy); M. Bajko, European Organization for Nuclear Research (Switzerland); Z. Szillasi, European Organization for Nuclear Research (Switzerland) and Institute of Nuclear Research of the Hungarian Academy of Sciences (Hungary); S. Buontempo, European Organization for Nuclear Research (Switzerland) and National Institute for Nuclear Physics (Italy); M. Giordano, Institute for Composite and Biomedical Materials (Italy) and Optosmart s.r.l. (Italy); A. Cusano, Univ. degli Studi del Sannio (Italy) and Optosmart s.r.l. (Italy)</td>
</tr>
<tr>
<td>8351 3D</td>
<td>Study on the all-fiber wind direction sensor and its application [8351-43]</td>
<td>J. Ni, C. Wang, T. Lei, J. Wang, Z. Sun, Y. Zhao, X. Liu, J. Chang, Shandong Academy of Sciences (China); G. Peng, The Univ. of New South Wales (Australia)</td>
</tr>
<tr>
<td>8351 3E</td>
<td>Fiber laser sensor interrogation system development and test [8351-150]</td>
<td>Z. Sun, J. Wang, Laser Institute of Shandong Academy of Sciences (China); J. Chang, Shandong Univ. (China); J. Ni, L. Min, C. Wang, Laser Institute of Shandong Academy of Sciences (China); G. Peng, The Univ. of New South Wales (China)</td>
</tr>
<tr>
<td>8351 3F</td>
<td>FBG tread wear detecting lines [8351-111]</td>
<td>W. Li, X. Dai, J. Liu, J. Pan, Q. Wang, Y. Zhang, Wuhan Univ. of Technology (China)</td>
</tr>
<tr>
<td>8351 3G</td>
<td>Closed loop resonator fiber optic gyro with precisely controlled bipolar digital serrodyne modulation [8351-76]</td>
<td>X. Wang, M. Kishi, Z. He, K. Hotate, The Univ. of Tokyo (Japan)</td>
</tr>
<tr>
<td>8351 3H</td>
<td>Condition monitoring of tapered roller bearings: a photogrammetric approach [8351-178]</td>
<td>S. A. Aye, Univ. of Pretoria (South Africa) and Univ. of Agriculture (Nigeria); P. S. Heyns, Univ. of Agriculture (Nigeria)</td>
</tr>
</tbody>
</table>
INDUSTRY PRESENTATIONS

8351 3I  Continuous monitoring of mining induced strain in a road pavement using fibre Bragg grating sensors (Invited Paper) [8351-173]
B. E. Whelan, M. Brunton, Monitor Optics Systems Ltd. (Australia); G. Nosenzo, Monitor Optics Systems Ltd. (Ireland); D. Kay, Mine Subsidence Engineering Consultants (Australia); H. Buys, AECOM (Australia)

8351 3J  Nuisance alarm suppression techniques for fibre-optic intrusion detection systems [8351-138]
S. S. Mahmoud, Y. Visagathilagar, J. Katsifolis, Future Fibre Technologies Pty Ltd. (Australia)

8351 3K  R&D on optical fiber sensors at the National Engineering Laboratory for Optic Fiber Sensing Technologies: fundamental and industrial aspects (Invited Paper) [8351-176]
M. Yang, D. Jiang, Wuhan Univ. of Technology (China)

8351 3L  Interferometric closed-loop fiber-optic gyroscopes [8351-11]
Y. N. Korkishko, V. A. Fedorov, V. E. Prilutskii, V. G. Ponomarev, I. V. Morev, S. M. Kostritskii, RPC Optolink Ltd. (Russian Federation)

8351 3M  Optical voltage sensor based on Mach-Zehnder LiNbO3 interferometer and fibre-optical technology [8351-20]
S. M. Kostritskii, Y. N. Korkishko, V. A. Fedorov, RPC Optolink Ltd. (Russian Federation)

POST-DEADLINE MANUSCRIPTS

8351 40  A new method of optical biopsy: demonstration of mechanical contrast in deep tissue using an optical coherence elastography needle probe [8351-500]
K. M. Kennedy, B. F. Kennedy, R. A. McLaughlin, The Univ. of Western Australia (Australia); D. D. Sampson, The Univ. of Western Australia (Australia) and Ctr. for Microscopy, Characterisation and Analysis (Australia)

8351 41  Drastic enhancement of Brillouin Stokes signal using pulsed pump and low-power erbium-doped fiber amplifier [8351-501]
Y. Mizuno, K. Nakamura, Tokyo Institute of Technology (Japan)

8351 42  Novel long-distance fiber-optic sensing systems based on random fiber lasers [8351-502]
Z. Wang, X. Jia, Y. Rao, Y. Jiang, W. Zhang, Univ. of Electronic Science & Technology of China (China)

Author Index
Conference Committee

Conference Chairs

John Canning, interdisciplinary Photonics Laboratories (iPL), School of Chemistry, The University of Sydney (Australia)

Gang-Ding Peng, Photonics and Optical Communications, School of Electrical Engineering and Telecommunications, The University of New South Wales (Australia)

International Steering Committee

Somnath Banerjee, Central Glass and Ceramic Research Institute (India)

Xiaoyi Bao, University of Ottawa (Canada)

Hartmut Bartelt, Institute of Photonics (Germany)

Arthur Braga, Pontificia Universidade Católica do Rio de Janeiro (Brazil)

John Canning, The University of Sydney (Australia)

Andrea Cusano, Università degli Studi del Sannio (Italy)

Bai-Ou Guan, Jinan University (China)

Banshi D. Gupta, Indian Institute of Technology, Delhi (India)

Kazuo Hotate, University of Tokyo (Japan)

Desheng Jiang, Wuhan University of Technology (China)

Wei Jin, The Hong Kong Polytechnic University (Hong Kong, China)

Hypolito Kalinowski, Universidade Tecnológica Federal (Brazil)

Martin Kristensen, Arhus Universitet (Denmark)

Byoungho Lee, Seoul National University (Korea, Republic of)

Yanbiao Liao, Tsinghua University (China)

Tongyu Liu, Shandong Academy of Sciences (China)

Yu-Lung Lo, National Cheng Kung University (Taiwan, China)

Alexis Mendez, MCH Engineering (United States)

Kyungwan Oh, Yonsei University (Korea)

Bertrand Poumellec, Université Paris Sud (France)

 Yunjian Rao, University of Electronic Science and Technology of China (China)

David Sampson, University of Western Australia (Australia)

José Luis Santos, Universidade do Porto (Portugal)

Perry Shum, Nanyang Technological University (Singapore)

Hwayaw Tam, The Hong Kong Polytechnic University (Hong Kong, China)

Frederique Vanholsbeeck, University of Auckland (New Zealand)

Anbo Wang, Virginia Polytechnic Institute and State University (United States)

Reinhardt Willsch, Institute of Photonics (Germany)
Technical Program Committee Chairs

Simon Fleming, The University of Sydney (Australia)
Stephen Collins, Victoria University (Australia)
Yunjiang Rao, University of Electronic Science and Technology of China (China)
John Canning, The University of Sydney (Australia)
Gang-Ding Peng, The University of New South Wales (Australia)

Technical Program Committee

Jianping Chen, Shanghai Jiao Tong University (China)
Yin-Chieh Lai, National Chiao Tung University (Taiwan, China)
Athikom Roeksabutr, Mahanakorn University of Technology (Thailand)
Hwayaw Tam, The Hong Kong Polytechnic University (Hong Kong, China)
Scott Wade, Swinburne University (Australia)
Aping Zhang, Zhejiang University (China)
Wei Jin, The Hong Kong Polytechnic University (Hong Kong, China)
Jun Chang, Shandong University (China)
Brant Gibson, University of Melbourne (Australia)
Tiegen Liu, Tianjin University (China)
Anna Mignani, Instituto di Fisica Applicata “Nello Carrara,” Consiglio Nazionale delle Ricerche (Italy)
Arnan Mitchell, RMIT University (Australia)
Ronghui Qu, Shanghai Institute of Optics and Fine Mechanics (China)
Limin Tong, Zhejiang University (China)
Chang Wang, Shandong Academy of Sciences (China)
Halina Rubinsztein-Dunlop, University of Queensland (Australia)
John Arkwright, Commonwealth Scientific and Industrial Research Organisation (Australia)
Mattias Aslund, The University of Sydney (Australia)
Min Gu, Swinburne University of Technology (Australia)
Kyriacos Kalli, Cyprus University of Technology (Cyprus)
Mark Prescott, Monash University (Australia)
David Webb, Aston University (United Kingdom)
Xiaoyi Bao, University of Ottawa (Canada)
Jayantha Epaarachchi, University of Southern Queensland (Australia)
Simon Fleming, The University of Sydney (Australia)
N. Granpayeh, Khaje Nasir Toosi University of Technology (Iran, Islamic Republic of)
Zuyuan He, University of Tokyo (Japan)
Gang-Ding Peng, The University of New South Wales (Australia)
Changyuan Yu, National University of Singapore (Singapore)
Xuping Zhang, Nanjing University (China)
Wende Zhong, Nanyang Technological University (Singapore)
David Moss, The University of Sydney (Australia)
Kevin Chen, Pittsburgh University (United States)
Muhammad Khawar Islam, University of Engineering and Technology Taxila (Pakistan)
Martin Kristensen, Aarhus Universitet (Denmark)
Sarun Sumriddetchkajorn, National Electronics and Computer Technology Center (Thailand)
Dingyuan Tang, Nanyang Technological University (Singapore)
Graham Town, Macquarie University (Australia)
John Ballato, The Center for Optical Materials Science and Engineering Technologies (COMSET), Clemson University (United States)
Somnath Bandyopadhyay, Central Glass and Ceramic Research Institute (CGCRI) (India)
Weihong Bi, Yanshan University (China)
Adrian Carter, Nufern (United States)
Zhe Chen, Jinan University (China)
Kin Seng Chiang, City University of Hong Kong (Hong Kong, China)
Yasufumi Enami, Hiroshima University (Japan)
Sheng-Lung Huang, National Taiwan University (Taiwan, China)
Shibin Jiang, Advalue Company (United States)
Ming-Jun Li, Corning Inc. (United States)
Cicero Martelli, Federal University of Technology (Brazil)
Tanya Monro, University of Adelaide (Australia)
Libo Yuan, Harbin Engineering University (China)
Wolfgang Ecke, Institute of Photonics (Germany)
Jacques Albert, Carleton University (Canada)
Kevin Cook, The University of Sydney (Australia)
Xingyong Dong, China Jiliang University (China)
Bai-Ou Guan, Jinan University (China)
Morten Ibsen, Optoelectronics Research Centre (ORC), Southampton University (United Kingdom)
Matthieu Lancry, Université Paris-Sud (France)
Byoungho Lee, Seoul National University (Korea, Republic of)
De-Yuan Shen, Fudan University (China)
Lei Xu, Fudan University (China)
Jim Katsifolis, Future Fibre Technologies (Australia)
Yong Huang, Comcore (China)
Hypolito Kalinowski, Federal University of Technology (Brazil)
Tongyu Liu, Shandong Academy of Sciences (China)
Alexis Mendez, MCH Engineering (United States)
Hwayaw Tam, The Hong Kong Polytechnic University (Hong Kong, China)
Zheng-Jun Xiong, Intelume (China)
Shuqiang Zhang, Yangtze Optical Fibre and Cable Company Ltd. (China)
Bertrand Poumellec, Université Paris-Sud (France)
John Ballato, Clemson University (United States)
John Canning, The University of Sydney (Australia)
Martin Kristensen, Aarhus Universitet (Denmark)
Arnan Mitchell, Royal Melbourne Institute of Technology (Australia)
Gang-Ding Peng, The University of New South Wales (Australia)

Local Organising Committee

John Arkwright, Commonwealth Science and Industrial Research Organization (Australia)
Mattias Aslund, The University of Sydney (Australia)
Adrian Carter, Nufem (United States)
Jong Chow, Australian National University (Australia)
Stephen Collins, Victoria University (Australia)
Kevin Cook, The University of Sydney (Australia)
Jayantha Epaarachchi, University of Southern Queensland (Australia)
Simon Fleming, The University of Sydney (Australia)
Scott Foster, Defence Science and Technology Organisation (Australia)
Brant Gibson, University of Melbourne (Australia)
Min Gu, Swinburne University of Technology (Australia)
John Holdsworth, University of Newcastle (Australia)
Jim Katsifolis, Future Fibre Technologies (Australia)
François Ladouceur, University of New South Wales (Australia)
Ian Littler, Commonwealth Science and Industrial Research Organisation (Australia)
Yanhua Luo, The University of New South Wales (Australia)
Arnan Mitchell, Royal Melbourne Institute of Technology (Australia)
Tanya Monro, University of Adelaide (Australia)
David Moss, The University of Sydney (Australia)
Mark Prescott, Monash University (Australia)
Halina Rubinsztein-Dunlop, University of Queensland (Australia)
David D. Sampson, The University of Western Australia (Australia)
Michael Stevenson, The University of Sydney (Australia)
Graham Town, Macquarie University (Australia)
Jiangtao Xi, University of Wollongong (Australia)

Session Chairs

Tutorial
Reinhardt Willsch, Institute of Photonics (Germany)

Physical Sensing
Scott Wade, Swinburne University (Australia)

Chemical and Environmental Sensing
Wei Jin, The Hong Kong Polytechnic University (Hong Kong, China)
Plenary Session and Invited Presentations
Yunjiang Rao, University of Electronic Science and Technology of China (China)

Integrated Technologies for Sensing
Martin Kristensen, Aarhus Universitet (Denmark)

Grating and Component Technologies for Sensing
Bai-Ou Guan, Jinan University (China)

Distributed, Multiplexed and Networked Sensing
Xiaoyi Bao, University of Ottawa (Canada)

Post Deadline Papers
Andrea Cusano, Università degli Studi del Sannio (Italy)

Plenary Session and Novel Materials for Sensing
Brant Gibson, University of Melbourne (Australia)

Industry Presentations
Zuyuan He, University of Tokyo (Japan)

Industrial Applications and Field Trials
Jim Katsifolis, Future Fibre Technologies (Australia)

Biological and Biomedical Sensing and Imaging
Kyriacos Kalli, Cyprus University of Technology (Cyprus)

Optical Fibres for Sensing
Adrian Carter, Nufern (United States)

Invited Presentation, Student Awards and Closing Ceremony
Graham Town, Macquarie University (Australia)

IEEE and SPIE Student Awards
Desheng Jiang, Wuhan University of Technology (China)
Kazuo Hotate, University of Tokyo (Japan)
Introduction

The Asia Pacific Optical Sensors (APOS) Conference series were launched in 2008, in Chengdu China, and alternates approximately every 18 months with major global sensing conferences such as International Conference on Optical Fiber Sensors. It was a timely and important event for the region, reflecting the prescience of its original founder: Prof. Rao of UESTC, Chengdu University, China. The second event was in 2010 in Guangzhou, China. In 2012 it was held outside of China for the first time, reflecting the broader growth of optical sensing research and development within the Asia Pacific region, bringing APOS to international maturity as the region’s premier optical sensing conference.

The Third Asia-Pacific Optical Sensors Conference 2012 (APOS2012) was held in Sydney, New South Wales, Australia, from January 31 to February 3, 2012. The Conference is jointly organized by The University of Sydney and The University of New South Wales and has involved many people throughout all phases. As chairs we warmly recognise their efforts: sometimes superhuman. All our committee members, both from within our shores and abroad, are gratefully acknowledged; without their efforts the diverse international flavour and quality of this event would not have been possible. The standards of the presentations, both invited and contributed, reflect the high regard this event has been held and for that we are appreciative. The Technical Committee has delivered on a rigorous set of standards we put in place to produce an excellent program and placing APOS amongst the important must do events of the region – the benchmark has certainly been set for the next conference!

We want to especially recognise the general mountain of logistics managed by Kevin Cook and Michael Stevenson, who reduced costs significantly to enable us to offer an outstanding venue on the harbour under the bridge for what must be said is remarkable value given the extraordinary prices being charged by many international events. The atmosphere for intimate networking and personal dialog, which is often missing in many events, is an important part of relationship and opportunity building in this area of the world, without a doubt now the centre of global activity. In this context, our commercial sponsors are also able to maximise exposure of their wares in this environment where we have managed to collocate all activities.

The conference has clearly taken the mantle as the region’s key forum for reporting the latest progress in optical and photonic sensing technologies and providing an unsurpassed collegiate atmosphere. It has become the regions première meeting point for academic researchers, technical and business professionals and end user industries to share and exchange their ideas and R&D
experiences. The previous events focused quite strongly on optical fibre and grating technologies, emphasising their explosive growth in the region. This event has an added component on biophotonics recognising the growth it too is experiencing in the region. The role of materials and interdisciplinary research is especially important in extending various optical and fibre optical sensing technologies, and its appropriate APOS 2012 followed soon after the International Year of Chemistry, in 2011. 2011 is also the Year of Humanitarian Engineering emphasising a special role for biomedical engineering and diagnostics as well as engineering to help provide the highest quality of life for all Earth’s citizens. It is a reminder of greater responsibilities and obligations than those which affect us most immediately within the spheres of our institutions.

What better venue to host a major conference than Sydney? It is one of the great international cities, cosmopolitan and multicultural. From the iconic opera house to the wonderful beaches, Sydney is endowed with both man-made and natural wonders that welcome the visitor. Artistic and scientific endeavours are also abundantly on display and we hope all attendees took time to enjoy the city and its offerings, particularly the famous Sydney Festival which also occurs at that time of year. Sydney always welcome your return after the event.

John Canning
Gang-Ding Peng