



SPIE[®]

2012 Laser Damage

XLIV Annual Symposium on
Optical Materials for High-Power Lasers

A decorative graphic consisting of several overlapping triangles in shades of red and green, arranged in a jagged, horizontal line across the middle of the page.

The leading forum on materials for
high power/high energy lasers

Technical Program

23–26 September 2012

National Institute of Standards
and Technology (NIST)
Boulder, Colorado, USA

spie.org/LD

Conference 8530

Sunday - Wednesday 23–26 September
2012 • Proceedings of SPIE Vol. 8530

SPIE Laser Damage

XLIV Annual Symposium on

Optical Materials for High Power Lasers

Conference Chairs:

Gregory J. Exarhos, Pacific Northwest National Lab. (USA)

Vitaly E. Gruzdev, Univ. of Missouri-Columbia (USA)

Joseph A. Menapace, Lawrence Livermore National Lab. (USA)

Detlev Ristau, Laser Zentrum Hannover e.V. (Germany)

M J Soileau, Univ. of Central Florida Office of Research &
Commercialization (USA)

International Program Committee:

Detlev Ristau, Laser Zentrum Hannover e.V. (Germany)

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Mireille Commandré, Institut Fresnel (France)

Stavros G. Demos, Lawrence Livermore National Lab. (USA)

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Univ. of Central Florida (USA)

Takahisa Jitsuno, Osaka Univ. (Japan)

Klaus Mann, Laser-Lab. Göttingen e.V. (Germany)

Carmen S. Menoni, Colorado State Univ. (USA)

Masataka Murahara, Tokai Univ. (Japan)

Jérôme Néauport, Commissariat à l'Énergie Atomique (France)

Semyon Papernov, Univ. of Rochester (USA)

Amy L. Rigatti, Univ. of Rochester (USA)

Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China)

Michelle D. Shinn, Thomas Jefferson National Accelerator Facility (USA)

Christopher J. Stolz, Lawrence Livermore National Lab. (USA)

Mini-Symposium Chair:

Stavros Demo, Lawrence Livermore National Lab. (USA)

Founding Organizers:

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Sunday 23 September

Sunday Events

Boulder Marriott, 2660 Canyon Blvd., Boulder

REGISTRATION MATERIAL PICK-UP

Room: Montrachet Room (1st floor)

Sun. 17:30 to 20:30

ROUND TABLE DISCUSSION

Boulder Marriott, Montrachet Room (1st floor)

Sun. 18:00 to 19:00

Surface Versus Bulk Laser Damage Mechanisms

Panel Moderators: **Stavros Demos**, Lawrence Livermore National Lab.(USA); **Michael Feit**, Lawrence Livermore National Lab. (USA)

The main purpose of the roundtable is to warm up symposium participants intellectually and to prepare them for active discussions during the Symposium. This year, the Round Table discusses the mechanisms of laser induced damage in the bulk and on the surface of optical materials. The discussion starts with a joint presentation by the moderators involving both up to date experimental results and theoretical interpretations. The focus is to identify similarities and differences in important physical properties and localized conditions occurring during a damage event induced on the surface versus in the bulk, and the corresponding material response after energy deposition leading to the formation of damage sites, i.e. irreversible observable modification. Although mostly excitation with nanosecond pulses will be considered in this discussion, some similarities and differences when using ultrashort pulses will be addressed.

WELCOME AND SOCIAL MIXER

Room: Montrachet Room (1st floor)

Sun. 19:00 to 20:30

Registration Material Pick-up continues until 20:30.

SPIE would like to express its deepest appreciation to the co-chairs, international program committee, session chairs, and authors who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contributions of our participants and members.

This program is based on commitments received up to the time of publication and is subject to change without notice. The SPIE Event Manager for this symposium is Diane Cline.

Monday 24 September

CONFERENCE LOCATION: NIST

Building 1 (Radio Bldg.)
324 Broadway, Boulder, CO

REGISTRATION MATERIAL PICK-UP

NIST Lobby Area Mon. 07:30 to 16:00

Attendees must check in with NIST Security at entrance
and have photo ID available.

Please allow for 15 minutes extra time on Monday.

POSTER PLACEMENT AT NIST

Rooms: 1 & 2 Mon. 07:50 to 08:30

OPENING REMARKS AND 2011 AWARDS PRESENTATION

Room: Auditorium. Mon. 08:30 to 09:00

INVITED SESSION

Room: NIST Auditorium Mon. 09:00 to 9:20

Overview of the Pacific Rim Laser Damage Meeting

Presenter: Jianda Shao,

Shanghai Univ. of Optics and Fine Mechanics (China)

2011 Award Winners

Best Oral Presentation:

**Electron dynamics in transparent materials
under high-intensity laser irradiation**

Paper 8190-41

Authors: **Bärbel Rethfeld, Oliver Brenk**, Technische
Univ. Kaiserslautern (Germany)

Best Poster Presentation:

**The impact ionization coefficient in
dielectric materials revisited**

Paper 8190-77

Authors: **C. Karras, Z. Sun, D. N. Nguyen,
L. A. Emmert, W. Rudolph**, The Univ. of New Mexico
(USA)

SESSION 1

Room: NIST Auditorium Mon. 09:20 to 10:00

Fundamental Mechanisms I

Session Chairs: MJ Soileau, Univ. of Central Florida Office of Research & Commercialization (USA); Vitaly E. Gruzdev, Univ. of Missouri-Columbia (USA)

9:20: Mechanisms of femtosecond laser ablation of dielectrics revealed by double pump: probe experiment (*Invited Paper*), Stéphane Guizard, Alexandros Mouskeftaras, Nikita Fedorov, Sergey Klimentov, Commissariat à l'Énergie Atomique (France)[8530-1]

MONDAY POSTER OVERVIEW

Room: NIST Auditorium Mon. 10:00 to 10:40

Poster authors are asked to give a 2-minute/2-viewgraph overview of their posters in the order they appear in the program.

Poster Session and Refreshment Break 10:40 to 11:30

POSTERS-MONDAY MORNING

Rooms 1 & 2 Mon. 10:40 to 11:30

Fundamental Mechanisms

Posters will be displayed for viewing during refreshment breaks from 10.40 to 11.30 and 15.40 to 16.30.

Modeling energy transfer and transport in laser-excited dielectrics, Oliver Brenk, Nils Brouwer, Anika Raemer, Technische Univ. Kaiserslautern (Germany); Orkhan Osmani, Donostia International Physics Ctr. (Spain); Bärbel Rethfeld, Technische Univ. Kaiserslautern (Germany)[8530-46]

Stimulated Raman scattering damage in KDP crystal and its suppression, Wei Han, China Academy of Engineering Physics (China)[8530-47]

Comparison of material response following exit surface laser-induced breakdown in fused-silica and KDP, Stavros G. Demos, Raluca A. Negres, Rajesh N. Raman, Michael D. Feit, Lawrence Livermore National Lab. (USA)[8530-82]

POSTERS-MONDAY

Room: Auditorium. Mon. 10:40 to 11:30

Thin Films

*Posters will be displayed from 10:40 to 11:30 and
15:40 to 16:30 for viewing.*

Oxide mixtures for UV coatings, Céline Gouldieff, Frank R. Wagner, Institut Fresnel (France); Lars O. Jensen, Mathias Mende, Laser Zentrum Hannover e.V. (Germany); Jean-Yves Natoli, Institut Fresnel (France); Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) and Ctr. for Quantum Engineering and Space-Time Research (Germany) [8530-48]

Laser-induced damage thresholds for 355nm AR coatings on LBO crystals, Shinji Motokoshi, Osaka Univ. (Japan) and ALPROT (Japan); Koji Tsubakimoto, Noriaki Miyanaga, Osaka Univ. (Japan); Masayuki Fujita, Osaka Univ. (Japan) and ALPROT (Japan). [8530-49]

Databases on damage threshold for HR and AR coatings in UV region, Shinji Motokoshi, Kota Kato, Katsuhiro Mikami, Takahisa Jitsuno, Osaka Univ. (Japan). [8530-50]

Applying hafnia mixtures to enhance the laser-induced damage threshold of coatings for third-harmonic generation optics, Mathias Mende, Lars O. Jensen, Henrik Ehlers, Laser Zentrum Hannover e.V. (Germany); Stefan Bruns, Michael Vergöhl, Fraunhofer-Institut für Schicht- und Oberflächentechnik (Germany); Peer Burdack, InnoLight GmbH (Germany); Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) and Ctr. of Quantum Engineering and Space-Time Research (Germany) [8530-51]

Measured and simulated nanosecond laser damage probabilities of niobia-silica and zirconia-silica mixtures coatings, Xinghai Fu, Institut Fresnel (France); Andrius Melninkaitis, Vilnius Univ. (Lithuania); Laurent Gallais, Institut Fresnel (France); Simonas Kicas, Ramutis Drazdys, Institute of Physics (Lithuania); Valdas Sirutkaitis, Vilnius Univ. (Lithuania); Mireille Commandré, Institut Fresnel (France) [8530-52]

Optical resistance of GaN and InGaN thin films, Mindaugas Šciuka, Mantas Dmukauskas, Tomas Grinys, Andrius Melninkaitis, Vilnius Univ. (Lithuania) [8530-53]

Optimization of ion beam sputtered Y₂O₃ for high laser damage resistance, Dinesh Patel, Peter F. Langston, Laura M. Imbler, Colorado State Univ. (USA); Luke A. Emmert, Wolfgang Rudolph, The Univ. of New Mexico (USA); Ashot S. Markosyan, Roger K. Route, Stanford Univ. (USA); Martin M. Fejer, The Univ. of New Mexico (USA); Carmen S. Menoni, Colorado State Univ. (USA) [8530-54]

Laser-induced damage thresholds and optical properties of TiO₂ and Al₂O₃ coatings prepared by atomic layer deposition, Lars O. Jensen, Heinrich Mädebach, Detlev Ristau, Laser Zentrum Hannover e.V. (Germany); Jarmo Maula, Beneq Oy (Finland); Karlheinz Gürtler, Consultant (Germany) [8530-55]

Temperature dependence of the optical absorption in amorphous Ta₂O₅ and SiO₂ dielectric thin films, Ashot S. Markosyan, Roger Route, Martin M. Fejer, Stanford Univ. (USA); Dinesh Patel, Carmen S. Menoni, Colorado State Univ. (USA) [8530-56]

Surfaces, Mirrors, and Contamination

Study of the LIDT degradation of optical components by intentional organic contamination, Benoit Mangote, Isabelle Tovena-Pecault, Jérôme Néauport, Commissariat à l'Énergie Atomique (France) [8530-57]

Scratch repair on fused silica optics by using a CO₂ laser, Philippe Cormont, Commissariat à l'Énergie Atomique (France); Laurent Gallais-During, Institut Fresnel (France); Laurent Lamaignère, Jean-Luc Rullier, Patrick Combis, Commissariat à l'Énergie Atomique (France) [8530-59]

Effect of conventional fused silica preparation and deposition techniques on surface roughness, scattering, and laser damage resistance, Simona Liukaityte, Gintare Bataviciute, Egidijus Pupka, Mindaugas Šciuka, Vilnius Univ. (Lithuania); Irena Kraujaliene, Dainius Tumosa, Alfridas Skrebutenas, Kestutis Juškevičius, Optolita UAB (Lithuania); Ramutis Drazdys, Rytis Buzelis, Tomas Tolenis, Simonas Kicas, Institute of Physics (Lithuania); Andrius Melninkaitis, Vilnius Univ. (Lithuania) [8530-61]

Cleaning practices and facilities for the national ignition facility, James A. Pryatel, Lawrence Livermore National Lab. (USA) [8530-62]

Laser-induced damage resistance of UV coatings on fused silica and CaF₂, Byungil Cho, Andy Lyu, Newport Corp. (USA); Mark Feldman, Spectra-Physics®: A Newport Corp. Div. (USA) . . [8530-83]

SESSION 2

Room: NIST Auditorium Mon. 11:30 to 12:30

Fundamental Mechanisms II

Session Chairs: **Carmen S. Menoni**, Colorado State Univ. (USA); **Semyon Papernov**, Univ. of Rochester (USA)

11:30: **Dynamics of fracture inside a single crystal induced by a focused femtosecond laser pulse**, Masaaki Sakakura, Takaya Tochio, Yuki Ishiguro, Miki Nakabayashi, Yasuhiko Shimotsuma, Kazuyuki Hirao, Kiyotaka Miura, Kyoto Univ. (Japan) [8530-2]

11:50: **Spectroscopic investigation of fs laser-induced defects in polymer and crystal media**, Deepak L. N. Kallepalli Lakshmi Narayana, Lasers, Plasmas et Procédés Photoniques (France); Narayana Rao Desai, Univ. of Hyderabad (India) [8530-3]

12:10: **Temperature dependence of laser-induced damage thresholds by short pulse laser**, Katsuhiro Mikami, Shinji Motokoshi, Toshihiro Somekawa, Takahisa Jitsuno, Masayuki Fujita, Kazuo A. Tanaka, Osaka Univ. (Japan) [8530-4]

Lunch Break 12:30 to 14:00

SESSION 3

Room: NIST Auditorium Mon. 14:00 to 15:40

Fundamental Mechanisms III

Session Chairs: **Jianda Shao**, Shanghai Institute of Optics and Fine Mechanics (China); **Jonathan W. Arenberg**, Northrop Grumman Aerospace Systems (USA)

14:00: Optical breakdown threshold and energy deposition in embedded nanostructures, Karol A. Janulewicz, Chul Min Kim, Hak Jae Lee, Asep Hapiddin, Peter V. Nickles, Dickson Joseph, Kurt E. Geckeler, Gwangju Institute of Science and Technology (Korea, Republic of) [8530-5]

14:20: Laser ablation mechanism of transparent dielectrics with picosecond laser pulses, Mingying Sun, Fraunhofer-Institut für Lasertechnik (Germany) and Shanghai Institute of Optics and Fine Mechanics (China); Urs Eppelt, Fraunhofer-Institut für Lasertechnik (Germany) and RWTH Aachen (Germany); Claudia Hartmann, Fraunhofer-Institut für Lasertechnik (Germany); Christof Siebert, TRUMPF Laser- und Systemtechnik GmbH (Germany); Jianqiang Zhu, Shanghai Institute of Optics and Fine Mechanics (China); Wolfgang Schulz, Fraunhofer-Institut für Lasertechnik (Germany) and RWTH Aachen (Germany) [8530-6]

14:40: Optical damage mechanism in borosilicate glass generated by a nanosecond pulsed laser at 1.064 micron, Binh T. Do, Ball Aerospace & Technologies Corp. (USA); Mark W. Kimmel, Michael V. Pack, Randal L. Schmitt, Sandia National Labs. (USA); Arlee V. Smith, AS-Photonics, LLC (USA) [8530-7]

15:00: Direct observation of UV laser-induced high-pressure glass-to-crystal transition and 3D visualization of structural dynamic evolution in fused silica, Chunhong Li, Xin Ju, Univ. of Science and Technology Beijing (China) [8530-8]

15:20: Surface and bulk effects in silica fibers caused by 405 nm CW diode laser irradiation and means for mitigation, Cornell P. Gonschior, Karl-Friedrich Klein, Technische Hochschule Mittelhessen (Germany); Tong Sun, Kenneth T. Grattan, City Univ. London (United Kingdom) [8530-9]

Poster Session and Refreshment Break 15:40 to 16:30



POSTERS-MONDAY AFTERNOON

Room: AuditoriumMon. 15:40 to 16:30

Posters will be displayed for viewing during refreshment breaks from 10:40 to 11:30 and 15:40 to 16:30.

SESSION 4

Room: NIST AuditoriumMon. 16:30 to 18:10

Fundamental Mechanisms IV

*Session Chairs: Amy L. Rigatti,
Univ. of Rochester (USA); Stavros G. Demos,
Lawrence Livermore National Lab. (USA)*

16:30: **Correlation of UV damage threshold with post-annealing in CVD-grown SiO₂ overlayers on etched fused silica substrates**, Manylibo J. Matthews, Nan Shen, Selim Elhadj, Phillip E. Miller, Arthur J. Nelson, Theodore A. Laurence, Julie Hamilton, Lawrence Livermore National Lab. (USA)[8530-10]

16:50: **Evaporation chemistry of CO₂-laser heated silica**, Selim Elhadj, Manylibo J. Matthews, Steven T. Yang, Diane J. Cooke, Lawrence Livermore National Lab. (USA)[8530-11]

17:10: **On the Einstein relation under optical absorption coefficient in nanostructured materials in the presence of laser**, Subhamoy Singha Roy, JIS College of Engineering (India). .[8530-12]

17:30: **Modeling laser irradiation of dielectrics: a road map to breakdown**, Oliver Brenk, Baerbel Rethfeld, Technische Univ. Kaiserslautern (Germany)[8530-13]

17:50: **Oscillatory term of the Keldysh formula**, Vitaly E. Gruzdev, Univ. of Missouri-Columbia (USA).[8530-14]

CLOSING REMARKS

Room: NIST AuditoriumMon. 18:10 to 18:20

Open House and Reception

**Mon. 18:30 to 20:00
5733 Central Ave, Boulder, CO 80301**

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Invitation and Driving Instructions
included in Registration Packet.

Tuesday 25 September

REGISTRATION MATERIAL PICK-UP

Room: NIST Lobby Area Tues. 07:30 to 16:00

Attendees must wear the NIST Security Badge when returning to NIST property.

POSTER PLACEMENT AT NIST

Room: 1 & 2 Tues. 7:50 to 8:20

Tuesday poster authors may set up their posters at this time.

SESSION 5

Room: NIST Auditorium Tues. 8:20 to 10:00

Thin Films I

Session Chairs: Joseph A. Menapace,
Lawrence Livermore National Lab. (USA);

Gregory J. Exarhos, Pacific Northwest National Lab. (USA)

8:20: What role do defects play in the last damage behavior of metal oxides? (*Invited Paper*), Carmen S. Menoni, Peter Langston, Erik M. Krous, Dinesh Patel, Colorado State Univ. (USA); Luke A. Emmert, The Univ. of New Mexico (USA); Ashot S. Markosyan, Stanford Univ. (USA); Brendan A. Reagan, Keith Wensing, Colorado State Univ. (USA); Roger Route, Martin M. Fejer, Stanford Univ. (USA); Jorge J. Rocca, Colorado State Univ. (USA); Wolfgang Rudolph, The Univ. of New Mexico (USA). [8530-15]

9:00: An exhaustive study of laser damage in ion-beam sputtered pure and mixture oxide thin films at 1030 nm with 500 fs pulse durations, Laurent Gallais, Benoit Mangote, Mireille Commandré, Institut Fresnel (France); Mathias Mende, Lars O. Jensen, Henrik Ehlers, Marco Jupé, Detlev Ristau, Laser Zentrum Hannover e.V. (Germany); Andrius Melninkaitis, Valdas Sirutkaitis, Vilnius Univ. (Lithuania); Simonas Kicas, Tomas Tolenis, Ramutis Drazdys, Institute of Physics (Lithuania). [8530-16]

9:20: Effect of laser durations on laser-induced damage threshold of multilayer dielectric gratings in vacuum, Fanyu Kong, Yunxia Jin, Weixiao Chen, Meiping Zhu, Tao Wang, Dawei Li, Zhaoyang Li, Guang Xu, Hongbo He, Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) [8530-17]

9:40: Brewster Angle Polarizing Beamsplitter Laser Damage Competition, Christopher J. Stolz, Lawrence Livermore National Lab. (USA); Jeff Runkel, Quantel USA (USA) [8530-18]

TUESDAY POSTER OVERVIEW

Room: NIST Auditorium Tues. 10:00 to 10:30

Poster authors are asked to give a 2-minute/2-viewgraph overview of their posters in the order they appear in the program

Poster Session and Refreshment Break 10:30 to 11:20

POSTERS-TUESDAY MORNING

Room: 1 & 2 Tues. 10:30 to 11:20

Posters will be displayed for viewing during refreshment breaks from 10:30 to 11:20 and 15:40 to 16:30.

POSTER SESSION

Room: 1 & 2 Tues. 10:30 to 11:20

Materials and Measurements

- Thermal management of kJ class laser amplifiers for operations at high-repetition rates**, Paul J. Phillips, Klaus Ertel, Paul D. Mason, Saumyabrata Banerjee, Justin Greenhalgh, John L. Collier, Rutherford Appleton Lab. (United Kingdom). [8530-63]
- Characterization of laser-induced material modification in thin films using third-harmonic microscopy**, Cristina Rodriguez, Reed A. Weber, Duy N. Nguyen, Luke A. Emmert, Wolfgang Rudolph, The Univ. of New Mexico (USA). [8530-64]
- Separation of different loss channels in DUV optical elements**, Klaus Mann, Bernhard Flöter, Uwe Leinhos, Julian Sudradjat, Bernd Schäfer, Laser-Lab. Göttingen e.V. (Germany). [8530-65]
- Improving laser damage threshold measurements: an explosive analogy**, Jonathan W. Arenberg, Northrop Grumman Aerospace Systems (USA); Michael D. Thomas, Spica Technologies, Inc. (USA). [8530-66]
- Automated test station for characterization of optical resistance with ultrashort pulses at multikilohertz repetition rates**, Andrius Melninkaitis, Mindaugas Šciuka, Gintare Batavičiute, Julius Mirauskas, Saulius Bucka, Valdas Sirutkaitis, Vilnius Univ. (Lithuania). [8530-67]
- An empirical investigation of the laser survivability curve: III**, Jonathan W. Arenberg, Northrop Grumman Aerospace Systems (USA); Wolfgang Riede, Alessandra Ciapponi, Paul Allenspacher, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Jonathan H. Herringer, Arrow Thin Films, Inc. (USA). [8530-68]
- Commissioning of the ELI-beamlines LIDT test station**, Daniel Kramer, Bedrich Rus, Efstratios Koutris, Jan Hrebicek, Institute of Physics of the ASCR, v.v.i. (Czech Republic). [8530-69]
- Automated laser damage threshold test systems of different test modes for optical elements**, Bin Ma, Yanyun Zhang, Hongping Ma, Hongfei Jiao, Xinbin Cheng, Pengfei He, Tongji Univ. (China); Huasong Liu, Yiqin Ji, Tianjin Jinhang Institute of Technology Physics (China); Zhanshan Wang, Tongji Univ. (China). . . . [8530-70]
- Laser-induced damage threshold test of optical components for high-peak-power OPCPA systems**, Andrey Lyachev, Trevor B. Winstone, Ian O. Musgrave, Marco Galimberti, Alexis Boyle, David A. Pepler, Cristina Hernandez-Gomez, Ian N. Ross, Rutherford Appleton Lab. (United Kingdom). [8530-71]
- Effective area of pulsed laser spots within ISO 21254-1,2,3 standards: critical analysis, extensions, and measurements in near ultraviolet: near infrared domain**, George Nemes, ASTiGMAT (USA) and National Institute for Lasers, Plasma and Radiation Physics (Romania); Aurel Stratan, Alexandru Zorila, Laurentiu Rusen, National Institute for Lasers, Plasma and Radiation Physics (Romania). [8530-72]
- Bayesian approach of laser-induced damage threshold analysis and determination of error bars**, Gintare Batavičiute, Povilas Grigas, Linas Smalakys, Andrius Melninkaitis, Vilnius Univ. (Lithuania). [8530-73]
- Laser damage testing of optical components under cryogenic conditions**, Jindrich Oulehla, Pavel Pokorny, Josef Lazar, Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic). [8530-74]
- Laser-induced damage performance of three kinds fluorophosphates glass with different doped ions**, Fuquan Li, China Academy of Engineering Physics (China). [8530-75]

Laser removal of positive-tone diazonaphthoquinone/novolak (DNQ/novolak) resist without occurring laser-induced damage to the silicon wafer, Hiroki Muraoka, Yuki Yanama, Yoshiaki Matsura, Tomosumi Kamimura, Osaka Institute of Technology (Japan); Hideo Horibe, Kanazawa Institute of Technology (Japan). [8530-76]

Investigation of laser damage initiation and the defect volume density in transparent YAG ceramics, Yuki Yamana, Tomosumi Kamimura, Hiroki Muraoka, Haruki Nakagawa, Osaka Institute of Technology (Japan); Katsuhiro Mikami, Shinji Motokoshi, Takahisa Jitsuno, Osaka Univ. (Japan); Takayuki Okamoto, Okamoto Optics Works (Japan); Yan Lin Aung, Akio Ikesue, World Lab Co., Ltd. (Japan). [8530-77]

Sandwich concept: enhancement for direct absorption measurements by laser-induced deflection (LID) technique, Christian Mühlig, Simon Bublitz, Institut für Photonische Technologien e.V. (Germany) [8530-79]

Automated test station for laser-induced damage threshold measurements according to ISO 21254-1,2,3,4 standards, Aurel Stratan, National Institute for Lasers, Plasma and Radiation Physics (Romania); George Nemes, ASTIGMAT (USA) and National Institute for Lasers, Plasma and Radiation Physics (Romania); Alexandru Zorila, Laurentiu Rusen, Sandel Simion, Constantin Blanaru, Constantin G. Fenic, Liviu Neagu, National Institute for Lasers, Plasma and Radiation Physics (Romania). [8530-80]

Parallel use of detection channels for LIDT testing in the UV range, Stefan Schrameyer, Marco Jupé, Lars O. Jensen, Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) [8530-81]

SESSION 6

Room: NIST Auditorium Tues. 11:20 to 13:00

Thin Films II

Session Chairs: **Mireille Commandré**, Institut Fresnel (France); **Vitaly E. Gruzdev**, Univ. of Missouri-Columbia (USA)

11:20: **Damage study of HR coatings irradiated from substrate-side by 1064 nm nanosecond laser pulses**, Xinbin Cheng, Jiangtao Lu, Bin Ma, Zhanshan Wang, Tongji Univ. (China) [8530-19]

11:40: **Continued advancement of laser damage resistant optically functional microstructures**, Douglas S. Hobbs, Bruce D. MacLeod, Ernest Sabatino, TelAztec LLC (USA) [8530-20]

12:00: **Multiple wavelength laser-induced damage of multilayer beam splitters**, Lei Yan, Chaoyang Wei, Yuanan Zhao, Kui Yi, Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) [8530-21]

12:20: **A statistical correlation study between surface quality and LIDT at 1064 nm**, Trey Turner, Quentin Turchette, Alex R. Martin, Research Electro-Optics, Inc. (USA) [8530-22]

12:40: **Thin film formation for strong adhesion with substrate and laser tolerance by photo-oxidized silicone oil**, Masataka Murahara, Tokai Univ. (Japan); Yuji Sato, Tokyo Institute of Technology (Japan); Takahisa Jitsuno, Osaka Univ. (Japan); Etsuo Fujiwara, Univ. of Hyogo (Japan); Yoshiaki Okamoto, Okamoto Optics Works (Japan) [8530-23]

Lunch Break 13:00 to 14:20

SESSION 7

Room: NIST Auditorium Tues. 14:20 to 15:40

Materials and Measurements I

Session Chairs: **Christopher J. Stolz**,
Lawrence Livermore National Lab. (USA);
James E. Andrew, AWE plc (United Kingdom)

14:20: **Dispersive multilayer optics: toward high-power applications** (*Invited Paper*), Vladimir Pervak, Ludwig-Maximilians-Univ. München (Germany) and Ultrafast innovations GmbH (Germany) [8530-43]

15:00: **Coatings of oxide composites** (*Invited Paper*), Lars O. Jensen, Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) [8530-24]

Poster Session and Refreshment Break 15:40 to 16:30

POSTERS-TUESDAY AFTERNOON

Room: 1 & 2 Tues. 15:40 to 16:30

Posters will be displayed for viewing during refreshment breaks from 10:30 to 11:20 and 15:40 to 16:30.

SESSION 8

Room: NIST Auditorium Tues. 16:30 to 18:10

Materials and Measurements II

Session Chairs: **Michelle D. Shinn**, Thomas Jefferson National Accelerator Facility (USA); **MJ Soileau**, Univ. of Central Florida Office of Research & Commercialization (USA)

16:30: **The role of polymer-mediated dopant correlations in damage moderation and self healing**, Mark G. Kuzyk, Shiva K. Ramini, Washington State Univ. (USA) [8530-26]

16:50: **The influences of key optical component performances to optical efficiency in high-power Yb:YAG thin-disk laser**, Jianli Shang, Huazhong Univ. of Science and Technology (China) and Wuhan National Lab. for Optoelectronics (China) and Wuhan Meiman Technology (Group) Co., Ltd., (China) [8530-27]

17:10: **A high-energy fibre-to-fibre connection for direct optical initiation systems**, Michael D. Bowden, Sarah L. Knowles, Matthew C. Cheeseman, AWE plc (United Kingdom) [8530-28]

17:30: **Energy losses in thermally cycled optical fibers constrained in small bend radii**, Eric M. Guild, Gregg L. Morelli, Honeywell Federal Manufacturing & Technologies, LLC (USA) [8530-29]

17:50: **Neutron testing of high-power optical fibers**, Matthew C. Cheeseman, Michael D. Bowden, AWE plc (United Kingdom); Adrian A. Akinci, Los Alamos National Lab. (USA); Sarah L. Knowles, Lee Webb, AWE plc (United Kingdom) [8530-30]

CLOSING REMARKS

Room: NIST Auditorium Tues. 18:10 to 18:20

Wine and Cheese Tasting Reception

Tues. 19:00 to 20:30

Sponsored by SPIE and the Conference Co-chairs
of Laser Damage XLIV

Reception at NCAR

1850 Table Mesa Dr., Boulder

All attendees are invited to join us for the enjoyable evening of wine tasting, local brews, and a selection of cheese appetizers.

Guest tickets are available for purchase, \$25 (USD).

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Wednesday 26 September

REGISTRATION MATERIAL PICK-UP

Room: NIST Lobby AreaWed. 07:30 to 16:00

Attendees must check in with NIST Security at entrance and have photo identification available.

SESSION 9

Room: NIST AuditoriumWed. 08:20 to 10:00

Materials and Measurements III

Session Chairs: Klaus Mann, Laser-Lab. Göttingen e.V. (Germany); Semyon Papernov, Univ. of Rochester (USA)

8:20: **Analysis of residual absorptions in optical materials using OPO-based pulsed photoacoustic spectroscopy with ppm/cm sensitivity**, Niklas Waasem, Fraunhofer-Institut für Physikalische Messtechnik (Germany) and Albert-Ludwigs-Univ. Freiburg (Germany); Stephan Fieberg, Frank Kuehnemann, Fraunhofer-Institut für Physikalische Messtechnik (Germany); Karsten Buse, Fraunhofer-Institut für Physikalische Messtechnik (Germany) and Albert-Ludwigs-Univ. Freiburg (Germany)[8530-32]

8:40: **Photothermal common-path interferometry: capabilities beyond the absorption test measurements**, Ashot S. Markosyan, Roger Route, Martin M. Fejer, Stanford Univ. (USA).[8530-33]

9:00: **Light scattering to detect imperfections relevant for laser-induced damage**, Sven Schröder, Tobias Herffurth, Marcus Trost, Angela Duparré, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany).[8530-34]

9:20: **Multichannel laser-induced contamination test bench**, Helmut B. Schröder, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Gintare Bataviciute, Vilnius Univ. (Lithuania); Karl Cichon, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Istvan Balasa, Lars O. Jensen, Laser Zentrum Hannover e.V. (Germany); Wolfgang Riede, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Adrian P. Tighe, European Space Research and Technology Ctr. (Netherlands) [8530-35]

9:40: **Advanced LIDT testing station in the frame of the HiLASE Project**, Jan Vanda, Laura Gemini, Roman Svabek, Tomas Mocek, Institute of Physics of the ASCR, v.v.i. (Czech Republic); Gilles Cheriaux, Ecole Nationale Supérieure de Techniques Avancées (France) [8530-36]

Coffee Break 10:00 to 10:30

SESSION 10

Room: NIST Auditorium Wed. 10:30 to 11:50

Materials and Measurements IV

*Session Chairs: Amy L. Rigatti, Univ. of Rochester (USA);
Takahisa Jitsuno, Osaka Univ. (Japan)*

10:30: **Pulse-width dependent femtosecond damage threshold measurements for pulse compression gratings**, Enam Chowdhury, Patrick Poole, Richard Freeman, The Ohio State Univ. (USA); Douglas J. Smith, Plymouth Grating Lab. (USA) . . . [8530-37]

10:50: **Laser-induced surface damage density measurements with small and large beams: the representativeness light**, Laurent Lemaître, Thierry Donval, Gabriel Dupuy, Commissariat à l'Énergie Atomique (France) [8530-38]

11:10: **Electric field dependant decay and recovery of anthraquinones doped into PMMA thin films: beyond 100% recovery**, Benjamin R. Anderson, Mark G. Kuzyk, Washington State Univ. (USA) [8530-25]

11:30: **355nm absorption in HfO₂ and SiO₂ monolayers with embedded Hf nanoclusters studied using photothermal heterodyne imaging**, Semyon Papernov, Univ. of Rochester (USA); Eunsung Shin, Paul T. Murray, Univ. of Dayton Research Institute (USA); Ansgar W. Schmid, James B. Oliver, Univ. of Rochester (USA) [8530-31]

Lunch Break 11:50 to 13:30



NIST FACILITY TOURS

Wednesday 11:50 to 12:50 • 2 tours offered

NIST has generously offered to provide 2 limited tours of the facility, including the NIST-F1 and NIST-F2 Atomic Clocks. Space is limited. Sign up onsite by 14:00 on Tuesday to reserve your place. First come, first served for Laser Damage Attendees only. A sign-up sheet will be at the registration desk.

SESSION 11

Room: NIST AuditoriumWed. 13:30 to 15:10

Mini-Symposium: Laser-Induced Plasma Interactions

Session Chairs: **Stavros G. Demos**, Lawrence Livermore National Lab. (USA); **Detlev Ristau**, Laser Zentrum Hannover e.V. (Germany)

13:30: **Plasma-particle interactions in a laser-induced plasma** (*Invited Paper*), David W. Hahn, Michael E. Asgill, Prasoon K. Diwakar, Univ. of Florida (USA)[8530-40]

14:10: **Laser ablation for chemical analysis: 50 years** (*Invited Paper*), Richard E. Russo, Jhanis J. Gonzalez, Vassilia Zormpa, Inhee Choi, Lawrence Berkeley National Lab. (USA); Alexander A. Bolshakov, Applied Spectra, Inc. (USA); Javier Ruiz, Samuel S. Mao, Lawrence Berkeley National Lab. (USA); Jong H. Yoo, Applied Spectra, Inc. (USA)[8530-41]

14:50: **Laser-induced gas plasma etching of fused silica under ambient conditions**, Selim Elhadj, Gabe Guss, Isaac L. Bass, Manylibo J. Matthews, Lawrence Livermore National Lab. (USA)[8530-42]

Coffee Break15:10 to 15:40

SESSION 12

Room: NIST AuditoriumWed. 15:40 to 16:20

Surfaces, Mirrors, and Contamination

Session Chairs: **Joseph A. Menapace**, Lawrence Livermore National Lab. (USA); **Michelle D. Shinn**, Thomas Jefferson National Accelerator Facility (USA)

15:40: **Measurement of debris and shrapnel plumes from cylindrical metal targets used in high-power laser systems**, James E. Andrew, Kathryn A. Wallace, AWE plc (United Kingdom)[8530-44]

16:00: **Influences of oil-contamination on LIDT and optical properties in dielectric coatings**, Takahisa Jitsuno, Hidetoshi Murakami, Shinji Motokoshi, Eiji Sato, Katsuhiro Mikami, Kota Kato, Tetsuji Kawasaki, Yoshiki Nakata, Nobuhiko Sarukura, Toshihiko Shimizu, Hiroyuki Shiraga, Noriaki Miyana, Hiroshi Azechi, Osaka Univ. (Japan)[8530-45]

CLOSING REMARKS

Room: NIST AuditoriumWed. 16:20 to 16:30

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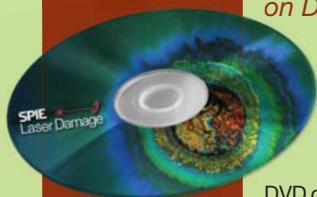
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