

Progress in Ultrafast Laser Modifications of Materials 2013

MATEC Web of Conferences Volume 8 (2013)

**Cargèse, France
14-19 April 2013**

Editors:

**Y. Bellouard
L. Canioni**

ISBN: 978-1-63266-276-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution license:
<http://creativecommons.org/licenses/by/2.0/>

You are free to:

Share – copy and redistribute the material in any medium or format.

Adapt – remix, transform, and build upon the material for any purpose, even commercial.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. The copyright is retained by the corresponding authors.

Printed by Curran Associates, Inc. (2014)

For additional information, please contact EDP Sciences – Web of Conferences
at the address below.

EDP Sciences – Web of Conferences
17, Avenue du Hoggar
Parc d'Activité de Courtabœuf
BP 112
F-91944 Les Ulis Cedex A
France

Phone: +33 (0) 1 69 18 75 75

Fax: +33 (0) 1 69 28 84 91

contact@webofconferences.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

ADVANCED PARALLEL PROCESSING THROUGH BEAM AND TEMPORAL SHAPING

Spatial Chirp Control of High-Intensity 4D Pulse Focusing for Laser-Matter Interactions	1
<i>C. Durfee, M. Greco, A. Meier, E. Block, J. Squier</i>	
Parallel Femtosecond Laser Processing with Vector-Wave Control	3
<i>Yoshio Hayasaki, Satoshi Hasegawa</i>	
Dynamic Optics for Ultrafast Laser Processing	5
<i>Patrick Salter, Martin Booth</i>	
Simultaneous Spatio-Temporal Focusing for Tissue Manipulation	7
<i>J. Squier, E. Block, M. Greco, A. Allende Motz, C. Durfee, O. Masihzadeh, D. Ammar, M. Kahook, N. Mandava</i>	
Taming Light with Photonic Lattices Written by Femtosecond Laser	9
<i>Mathieu Bellec, Giorgos M. Nikolopoulos, Stelios Tzortzakos</i>	
Observation of Quill Effect Induced by Distortion of Spatial Beam Profile	11
<i>Shigeki Matsuo, Kei Enjo Yoshifumi Umeda, Shuichi Hashimoto</i>	
Linear and Nonlinear Light Dynamics in Photonic Lattices	13
<i>Mathieu Bellec, Giorgos M. Nikolopoulos, Stelios Tzortzakos</i>	

FEMTOSECOND LASER-INDUCED MODIFICATIONS IN VARIOUS MATERIALS

Direct Laser-Writing in Silver-Zinc Doped Phosphate Glasses: Correlated Linear and Nonlinear Optical Properties	15
<i>Y. Petit, G. Papon, A. Royon, N. Marquestaut, G. Yang, M. Vangheluwe, K. Mishchik, M. Dussauze, V. Rodriguez, T. Cardinal, L. Canioni</i>	
Engineering Materials for Mid-Infrared Optical Sensor Applications	16
<i>K. A. Richardson, J. D. Musgraves, P. Wachtel, S. Novak, S. Danto, A. Agarwal, V. Singh, P-T Lin, L. C. Kimerling, J. Hu, Z. Yi, H. Lin, J. Giammarco, A. P. Soliani, I. Luzinov, J. Hensley</i>	
Antisymmetric Distribution of Permanent Refractive Index Change in β-BaB₂O₄ Crystal Under Exposure of Femtosecond Pulses	17
<i>A. G. Okhrimchuk, S. G. Grechin, A. E. Kokh, V. Mezentsev</i>	
Femtosecond Laser Desorption of Thin Polymer Films from a Dielectric Surface	19
<i>L. Mercadier, J. Peng, Y. Sultan, T. Davis, D. M. Rayner, P. B. Corkum</i>	
Interaction of Short and Intense Laser Pulses with Dielectric Materials: From Absorption to Ablation	21
<i>Guillaume Duchateau, Benoît Chimier, Vladimir Tikhonchuk</i>	
Direct Laser Writing of Efficient Effective Second Order Nonlinear Optical Properties in a Tailored Silver-Doped Phosphate Glass	23
<i>G. Papon, A. Royon, N. Marquestaut, A. Fargues, Y. Petit, M. Dussauze, V. Rodriguez, T. Cardinal, L. Canioni</i>	
Scaling of Black Silicon Processing Time by High Repetition Rate Femtosecond Lasers	24
<i>Giorgio Nava, Roberto Osellame, Roberta Ramponi, Krishna Chaitanya Vishnubhatla</i>	
Laser Assisted Modification of Poled Silver-Doped Nanocomposite Soda-Lime Glass	26
<i>Rokas Drevinskas, Martynas Beresna, Olivier Deparis, Peter G. Kazansky</i>	
Controllable 3D Crystallization in SiO₂-Based Glasses by Femtosecond Laser	28
<i>X. He, C. Fan, B. Poumellec, F. Brisset, Q. Liu, H. Zeng, G. Chen, X. Zhao, M. Lancry</i>	
Femtosecond Laser Post-Processing of Metal Parts Produced by Laser Additive Manufacturing	29
<i>Ilya Mingareev, Tobias Bonhoff, Ashraf F. El-Sherif, Martin Richardson</i>	
Femtosecond Single-Pulse Absorption in Semiconductors with Varying Dopant Concentration	30
<i>Mark Ramme, Andrew Housman, Ilya Mingareev, Martin Richardson</i>	
Influence of Femtosecond Surface Modification of TiO₂ Layer to Features of Organic Solar Cell	32
<i>Vytautas Sabonis, Giedrius Juška, Tadas Malinauskas, Vytautas Getautis, Kestutis Arlauskas</i>	

NANOSTRUCTURES FORMATION

Ultrashort Pulse Induced Nanogratings	34
<i>Stefan Nolte, Felix Zimmermann, Sören Richter, Anton Plech, Ulf Peschel, Andreas Tünnermann</i>	

Nonlinear Optical Mechanism of Forming Periodical Nanostructures in Large Bandgap Dielectrics	36
<i>R. Grunwald, S. K. Das, A. Debroy, E. McGlynn, H. Messaoudi</i>	
Photoinduced Self-Assembly of Nanostructure in Glass	38
<i>Y. Shimotsu, T. Asai, M. Sakakura, K. Hirao, K. Miura, P. G. Kazansky</i>	
Avant-Garde Ultrafast Laser Writing	40
<i>P. G. Kazansky, M. Beresna, M. Gecevicius</i>	
Dynamical Studies on the Generation of Periodic Surface Structures by Femtosecond Laser Pulses	42
<i>A. Rosenfeld, S. Höhm, J. Bonse, J. Krüger</i>	
Femtosecond Generation of Nano-Fibers	44
<i>Martin Richardson, Mark Ramme, Arnaud Royon, Thierry Cardinal, Lionel Canioni</i>	
Investigation and Control of Ultrafast Laser-Induced Nanoscale Patterns in Bulk Fused Silica	46
<i>R. Stoian, K. Mishchik, G. Cheng, M. Zamfirescu, C. Maclair, C. D'Amico</i>	
Formation and Applications of Periodic Structures in Transparent Materials Induced by Single FS Laser Beam	48
<i>Jianrong Qiu</i>	
Defined Nano-Structuring with Ultrashort Pulses in Gelatin Biopolymer Films for Tissue-Engineering	50
<i>Chandra S. R. Nathala, Alben Daskalova, Irina Bliznakova, Stefan Lueftenegger, Alexandra Zhelyazkova, Seres Enikoe, Thomas Ganz, Wolfgang Husinsky</i>	

PROCESS CHARACTERIZATION AND SOME ASPECTS OF FEMTOSECOND LASER DIRECT WRITING

Plasma Imaging and Optimization of Energy Deposition during Femtosecond-Laser Processing	52
<i>J. Solis, J. Siegel, A. Ferrer, A. Ruiz De La Cruz</i>	
High-Irradiance Effects in Femosecond Laser Fabrication	54
<i>Ricardas Buividas, Gediminas Gervinskas, Saulius Juodkazis</i>	
Asymmetric Orientational Writing Dependence on Polarization and Direction in Glass with Femtosecond Laser Irradiation	56
<i>Bertrand Poumellec, Matthieu Lancry, Chaxing Fan, Rudy Desmarchelier, Huidan Zeng, Bernard Bouguignon, Guorong Chen</i>	
Femtosecond Laser Processing of Fused Silica: From Process Characterization to Applications in Optomechanics	58
<i>Yves Bellouard</i>	
Spatially Resolved Correlation Between Glass Structure and Refractive Index Modifications Resulting from Irradiation of Chalcogenide Glass by Femtosecond Pulse Train	60
<i>P. Masselin, D. Le Coq, A. Cuisset, E. Bychkov</i>	
The Puzzle of Longitudinal Electric Field Interaction with Transparent Media	62
<i>Jingyu Zhang, Mindaugas Gecevicius, Martynas Beresna, Andrey G. Kazanskii, Peter G. Kazansky</i>	
Raman and Fluorescence Correlative Microscopy in Polarized Light to Probe Local Femtosecond Laser-Induced Amorphization of the Doped Monoclinic Crystal LYB:Eu	64
<i>Nicolas Marquestaut, Marc Dussauze, Yannick Petit, Arnaud Royon, Philippe Veber, Véronique Jubera, Michel Couzi, Vincent Rodriguez, Thierry Cardinal, Lionel Canioni</i>	
Nanograting Orientation Influence on Stress Induced by Femtosecond Laser in Fused Silica	66
<i>Audrey Champion, Martynas Beresna, Peter G. Kazansky, Yves Bellouard</i>	
Optical Analysis of Direct Laser Written Structures	68
<i>Xiang Liu, Patrick Salter, Martin Booth</i>	
Investigation on Repetition Rate and Pulse Duration Influences on Ablation Efficiency of Metals Using a High Average Power Yb-Doped Ultrafast Laser	70
<i>J. Lopez, R. Torres, Y. Zaouter, P. Georges, M. Hanna, E. Mottay, R. Kling</i>	
Optical Interference and Self-Scattering Effect on Laser Ablation of Thin Silicon Films	72
<i>Hao Zhang, D. Van Oosten, D. M. Krol, J. I. Dijkhuis</i>	

APPLICATION IN OPTOFLUIDICS AND IN MICROFABRICATION

Laser Etched Gratings Inside Microstructured Optical Fibres	74
<i>Maria Konstantaki, Georgios Tsiibidis, Paul Childs, Michele Sozzi, Stavros Pissadakis</i>	
Femtosecond Laser Direct Writing of Three-Dimensional Micro/Nanofluidics in Porous Glass	76
<i>Cheng Ya, Yang Liao, Koji Sugioka</i>	
Digital Photonic Production of 3D Micro Fluidics in Glass by High Speed Micro Scanner	78
<i>Jens Gottmann, Martin Hermans, Jürgen Ortmann</i>	

Femtosecond Laser Micromachining as an Enabling Tool for Optofluidics and Quantum Optics	80
<i>R. Osellame</i>	
Ship-in-a-Bottle Biomicrochips Fabricated by Hybrid Femtosecond Laser Processing	81
<i>Koji Sugioka, Dong Wu, Katsumi Midorikawa</i>	
Fabry-Perot Vapor Microsensors Fabricated onto Fibre Endface by Multiphoton Polymerization Technique	83
<i>Vasileia Melissinaki, Maria Vamvakaki, Maria Farsari, Stavros Pissadakis</i>	
An Integrated Fluorescence Activated Cell Sorter Fabricated by Femtosecond Laser Micromachining	85
<i>P. Paié, F. Bragheri, R. Martinez Vazquez, N. Bellini, R. Ramponi, R. Osellame, P. Minzioni, I. Cristiani, C. Mondello</i>	
Fabrication of Topologically-Complex 3D Microstructures by Femtosecond Laser Machining and Polymer Molding	87
<i>Allison Schaap, Yves Bellouard</i>	
Hybrid Chemical Etching of Femtosecond Irradiated 3D Structures in Fused Silica Glass	89
<i>Sara Lo Turco, Roberto Osellame, Roberta Ramponi, Krishna Chaitanya Vishnubhatla</i>	
Femtosecond Laser Structuring in Optical Fiber and Transparent Films	91
<i>Peter R. Herman, Kyle H. Y. Cheng, Jason R. Grenier, Moez Haque, Kenneth K. C. Lee</i>	

PHOTONICS AND OPTICAL COMPONENTS

Bragg Grating Waveguide Array Ultrafast Laser Inscribed into the Cladding of a Flat Fiber	94
<i>Stephen J. Beecher, Robert R. Thomson, Graeme Brown, Andrew. S. Webb, Jayanta. K. Sahu, Ajoy K. Kar</i>	
Direct Writing of Photonic Structures by Two-Photon Polymerization	96
<i>Yan Li, Zhaopei Liu, Haibo Cui, Yun-Feng Xiao, Hong Yang, Qihuang Gong</i>	
Nonlinear Light Propagation in FS Laser-Written Waveguide Arrays	98
<i>A. Szameit, S. Nolte</i>	
Ultrafast Laser Inscribed Integrated Photonics: Material Science to Device Development	100
<i>S. Gross, T. D. Meany, A. Arriola, C. Miese, R. J. Williams, Y. Duan, Q. Liu, I. Spaleniak, M. Ams, P. Dekker, N. Jovanovic, A. Fuerbach, M. Ireland, M. J. Steel, D. G. Lancaster, H. Ebendorff Heidepriem, T. M. Monro, M. J. Withford</i>	
Optical Cladding Waveguides in Dielectric Crystals Produced by Femtosecond Laser Inscription	102
<i>Feng Chen</i>	
Femtosecond-Laser Writing of Photonic Structures in Zinc Phosphate Glasses	104
<i>Denise M. Krol</i>	
Fractional Bloch Oscillations in Photonic Lattices	106
<i>G. Corrielli, A. Crespi, G. Della Valle, S. Longhi, R. Osellame</i>	
Single-Step Fabrication of Stressed Waveguides with Tubular Depressed-Cladding in Phosphate Glasses Using Ultrafast Vortex Laser Beams	108
<i>Guanghua Cheng, Xuewen Long</i>	
Low Bend Loss Waveguides and Photonic Bandgaps Enabled by High Index Contrast Modifications	110
<i>Simon Gross, Alexander Arriola, Nemanja Jovanovic, Ned Charles, Peter G. Tuthill, Santiago M. Olaizola, Alexander Fuerbach, Michael J. Withford</i>	
Fresnel Lenses Fabricated by Femtosecond Laser Micromachining on Polymer 1D Photonic Crystal	112
<i>Surya S. K. Guduru, Francesco Scotognella, Luigino Criante, Rebeca Martinez Vazquez, Roberta Ramponi, Krishna Vishnubhatla</i>	
Second Harmonic Generation of Violet Light in Femtosecond-Laser-Inscribed BiB₃O₆ Cladding Waveguides	114
<i>Yuechen Jia, Javier R. Vázquez De Aldana, Qingming Lu, Daniel Jaque, Feng Chen</i>	
Bragg Diffraction Gratings Formed in Bulk Fused Silica by Femtosecond Bessel Beams	116
<i>Mindaugas Mikutis, Tadas Kudrius, Domas Paipulas, Saulius Juodkazis</i>	
Variable Period Change of Femtosecond Written Fiber Bragg Gratings with a Deformed Wavefront	118
<i>Christian Voigtländer, Ria G. Krämer, Jens U. Thomas, Daniel Richter, Andreas Tännermann, Stefan Nolte</i>	
Femtosecond Laser Pulse Written Volume Bragg Gratings	120
<i>Daniel Richter, Christian Voigtländer, Ria G. Krämer, Jens U. Thomas, Andreas Tännermann, Stefan Nolte</i>	
Ultrafast Laser Fabrication of Bragg Waveguides in GLS Chalcogenide Glass	122
<i>Ben McMillen, Botao Zhang, Kevin Chen</i>	
Author Index	