

PROCEEDINGS OF SPIE

Fundamentals of Laser-Assisted Micro- and Nanotechnologies 2013

Vadim P. Veiko
Tigran A. Vartanyan
Editors

24–28 June 2013
St. Petersburg-Pushkin, Russian Federation

Organized by
National Research University of Information Technologies, Mechanics and Optics (Russian Federation)
General Physics Institute of Russian Academy of Sciences (Russian Federation)

Sponsored by
Russian Federation Ministry of Education and Science (Russian Federation) • National Research University of Information Technologies, Mechanics and Optics (Russian Federation) • Russian Foundation for Basic Research • General Physics Institute of Russian Academy of Sciences • Dynasty Foundation • Leading Scientific School of Russian Federation "Fundamentals of Laser-Assisted Micro- and Nano Technologies" • Tzarskoje Selo State Museum (Russian Federation) • Laser Track Ltd. (Russian Federation) Lasers & Apparatus TM Ltd. (Russian Federation) • Lasertech Ltd., Lasers Center ICo • Laser Center ITMO TRIZ Centre "Tvortchestvo" Ltd. (Russian Federation) • "LaserVarioRakurs" • East-West-Science Center (OWWZ), Kassel University (Germany) • Russian Portal of IT, Optics & Photonics (ITOP)

Cooperating Organization
Laser Association, D.S. Rozhdestvensky Russian Optical Society

Published by
SPIE

Volume 9065

Proceedings of SPIE 0277-786X, V. 9065

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

Fundamentals of Laser-Assisted Micro- and Nanotechnologies 2013, edited by Vadim P. Veiko, Tigran A. Vartanyan,
Proc. of SPIE Vol. 9065, 906501 · © 2013 SPIE · CCC code: 0277-786X/13/\$18 · doi: 10.1117/12.2053832

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Fundamentals of Laser-Assisted Micro- and Nanotechnologies 2013*, edited by Vadim P. Veiko, Tigran A. Vartanyan, Proceedings of SPIE Vol. 9065 (SPIE, Bellingham, WA, 2013) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819499929

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2013, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/13/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

ix	<i>Symposium Committees</i>
xiii	<i>Introduction</i>

LASER-MATTER INTERACTION

- 9065 02 **Ultrashort laser-matter interaction at moderate intensities: two-temperature relaxation, foaming of stretched melt, and freezing of evolving nanostructures (Invited Paper)** [9065-27]
N. A. Inogamov, L.D. Landau Institute for Theoretical Physics (Russian Federation); V. V. Zhakhovsky, Joint Institute for High Temperatures (Russian Federation) and Univ. of South Florida (United States); Y. V. Petrov, V. A. Khokhlov, L.D. Landau Institute for Theoretical Physics (Russian Federation); S. I. Ashitkov, Joint Institute for High Temperatures (Russian Federation); K. P. Migdal, D. K. Ilitsky, All-Russia Research Institute of Automatics (Russian Federation); Y. N. Emirov, Florida International Univ. (United States); K. V. Khishchenko, P. S. Komarov, Joint Institute for High Temperatures (Russian Federation); V. V. Shepelev, Institute for Computer Aided Design (Russian Federation); M. B. Agranat, Joint Institute for High Temperatures (Russian Federation); S. I. Anisimov, L.D. Landau Institute for Theoretical Physics (Russian Federation); I. I. Oleynik, Univ. of South Florida (United States); V. E. Fortov, Joint Institute for High Temperatures (Russian Federation)
- 9065 03 **Kinetic coefficients for d-band metals in two-temperature states created by femtosecond laser irradiation** [9065-28]
K. P. Migdal, All-Russia Research Institute of Automatics (Russian Federation); Y. V. Petrov, N. A. Inogamov, L.D. Landau Institute for Theoretical Physics (Russian Federation)
- 9065 04 **Efficient generation of monochromatic x-ray emission from laser plasma by repetition rate sub-relativistic laser pulses** [9065-31]
A. Gorjaev, M. Sedov, St. Petersburg State Univ. (Russian Federation); A. Andreev, St. Petersburg State Univ. (Russian Federation) and Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); N. Zhavoronkov, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany)
- 9065 05 **Damage threshold measurements: Self-focusing or intrinsic damage? (Invited Paper)** [9065-11]
O. Efimov, HRL Labs., LLC (United States)
- 9065 06 **Collision frequencies and absorption calculations for ultra-short laser interactions with dielectric materials** [9065-7]
T. E. Itina, N. S. Shcheblanov, Lab. Hubert Curien, CNRS, Univ. de Lyon (France)

- 9065 07 **On uniformity of the field inside small scatterers** [9065-43]
V. G. Farafonov, St. Petersburg State Univ. of Aerospace Instrumentation (Russian Federation); V. B. Il'in, St. Petersburg State Univ. of Aerospace Instrumentation (Russian Federation) and Pulkovo Astronomical Observatory (Russian Federation); M. V. Sokolovskaya, E. G. Semenova, St. Petersburg State Univ. of Aerospace Instrumentation (Russian Federation)
- 9065 08 **Investigation of nonlinear refraction and absorption in Mg- and Zr-doped LiNbO₃ with the aid of Z-scan techniques** [9065-8]
S. M. Kostitskii, RPC Optolink Ltd. (Russian Federation); M. Aillerie, Univ. of Lorraine (France) and Supélec (France); E. Kokanyan, Institute for Physical Research (Armenia)
- 9065 09 **Modeling of thin Cr film oxidation under the action of ultrashort laser pulses** [9065-30]
E. B. Yakovlev, O. N. Sergaeva, V. V. Svirina, M. V. Yarchuk, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

HIGH-TECH LASER-ASSISTED APPLICATIONS

- 9065 0A **Laser active thermography for non-destructive testing (Invited Paper)** [9065-21]
A. Semerok, C. Grisolia, Commissariat à l'Énergie Atomique (France); S. V. Fomichev, Commissariat à l'Énergie Atomique (France) and NRC Kurchatov Institute (Russian Federation); P.-Y. Thro, Commissariat à l'Énergie Atomique (France)
- 9065 0B **Laser plasma ignition: status, perspectives, solutions (Invited Paper)** [9065-24]
E. Wintner, Vienna Univ. of Technology (Austria) and Indian Institute of Technology Kanpur (India); H. Kofler, Vienna Univ. of Technology (Austria); D. K. Srivastava, A. K. Agarwal, Indian Institute of Technology Kanpur (India)
- 9065 0C **Single photon sources for secure quantum communication (Invited Paper)** [9065-29]
S. G. Lukishova, The Institute of Optics, Univ. of Rochester (United States)
- 9065 0D **Synthesis of stable silver colloids by laser ablation in water** [9065-46]
A. E. Tyurnina, V. Ya. Shur, R. V. Kozin, D. K. Kuznetsov, E. A. Mingaliev, Ural Federal Univ. (Russian Federation)
- 9065 0E **Optimization of multi-function integrated optics chip fabricated by proton exchange in LiNbO₃** [9065-9]
S. M. Kostitskii, Yu. N. Korkishko, V. A. Fedorov, RPC Optolink Ltd. (Russian Federation)
- 9065 0F **Laser creation of submicron glass fibers** [9065-36]
D. A. Sinev, V. A. Kochetova, A. D. Kochetov, A. A. Petrov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 0G **Laser-induced copper deposition with weak reducing agents** [9065-44]
V. A. Kochemirovsky, S. A. Fateev, L. S. Logunov, I. I. Tumkin, S. V. Safonov, E. M. Khairullina, St. Petersburg State Univ. (Russian Federation)
- 9065 0H **High-performance fiber Bragg gratings exposed by a single 17-ns excimer laser pulse in birefringent optical fiber with an elliptical stress cladding** [9065-26]
S. V. Varzhel', A. A. Petrov, A. I. Gribaev, D. A. Palanjyan, K. A. Konnov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

- 9065 0I **Low-dose laser sintering of Cu nanoparticles on the ceramic substrate during ink-jet interconnection** [9065-2]
I. Shishkovsky, Samara State Univ. (Russian Federation) and P.N. Lebedev Physical Institute (Russian Federation); V. Scherbakof, P.N. Lebedev Physical Institute (Russian Federation); I. Volyansky, Samara State Univ. (Russian Federation)
- 9065 0J **Investigations of the selective laser melting of the overhang layers** [9065-15]
Y. Chivel, MerPhotonics (France)
- 9065 0K **Femtosecond-laser-induced destruction of boron-nitride nanotubes and boron-nitride doped graphene** [9065-10]
B. Bauerhenne, N. Eschstruth, E. S. Zijlstra, M. E. Garcia, Univ. Kassel (Germany)
- 9065 0L **Peculiarities of substrate mass loss under micron pulse laser direct structuring** [9065-3]
I. Volyansky, Samara State Univ. (Russian Federation); I. Shishkovsky, Samara State Univ. (Russian Federation) and P.N. Lebedev Physical Institute (Russian Federation)

LASER-INDUCED PHASE-STRUCTURE MODIFICATION

- 9065 0M **3D express crystallization of Foturan glass at CO₂ laser annealing on defects produced by picosecond laser** [9065-33]
V. P. Veiko, M. M. Sergeev, E. I. Ageev, A. A. Petrov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 0N **The peculiarities of local laser oxidation of metal films** [9065-35]
D. A. Sinev, E. A. Shakhno, A. M. Kulazhkin, V. A. Kochetova, A. D. Kochetov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 0O **Ultrafast laser processing of glass-phase materials: mathematical simulation** [9065-41]
T. N. Sokolova, E. L. Surmenko, Y. V. Chebotarevsky, A. V. Konyushin, I. A. Popov, D. A. Bessonov, Gagarin Saratov State Technical Univ. (Russian Federation)
- 9065 0P **Forming micro-optical elements of extended form in the bulk of porous glass plates sodden with glycerol water solution under the laser irradiation** [9065-23]
R. A. Zakoldaev, M. M. Sergeev, G. K. Kostyuk, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 0Q **Laser-induced modification in the bulk of photochromic porous glass impregnated with silver halides** [9065-32]
M. M. Sergeev, G. K. Kostyuk, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 0R **Picosecond laser structuring of monocrystalline silicon surface** [9065-45]
I. Guk, G. Shandybina, E. Yakovlev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); L. Golovan, Lomonosov Moscow State Univ. (Russian Federation)
- 9065 0S **Microstructuring system SiO₂/Si with nanosecond pulsed fiber laser** [9065-37]
A. M. Skvortsov, V. P. Veiko, C. T. Huynh, R. A. Khaletskiy, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

- 9065 OT **Nanostructured system SiO₂/Si by ArF excimer laser irradiation** [9065-39]
C. T. Huynh, A. M. Skvortsov, A. A. Petrov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 OU **Destruction of monocrystalline silicon with nanosecond pulsed fiber laser accompanied by the oxidation of ablation microparticles** [9065-38]
V. P. Veiko, A. M. Skvortsov, C. T. Huynh, A. A. Petrov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 OV **The mechanisms of the photostimulated structural changes in molecular layers of cyanine compounds** [9065-42]
A. Starovoytov, E. Kaliteevskaya, V. Krutyakova, T. Razumova, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)
- 9065 OW **Photoinduced modification of component composition of molecular layers with silver nanoparticles** [9065-13]
N. A. Toropov, A. A. Starovoytov, E. N. Kaliteevskaya, V. P. Krutyakova, T. A. Vartanyan, N. B. Leonov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

LASER CLEANING AND ARTWORKS CONSERVATION

- 9065 OX **Laser cleaning experiences on sculptures' materials: terracotta, plaster, wood, and wax (Invited Paper)** [9065-16]
C. Pelosi, Univ. of Tuscia (Italy); D. Fodaro, Istituto Superiore per la Conservazione e il Restauro (Italy); L. Sforzini, Livia Sforzini Restauro e Conservazione (Italy); A. Lo Monaco, Univ. of Tuscia (Italy)
- 9065 OY **Latest advancements in fluorescence hyperspectral lidar imaging of the cultural heritage (Invited Paper)** [9065-19]
V. Raimondi, Istituto di Fisica Applicata Nello Carrara, CNR (Italy); C. Conti, Soprintendenza Speciale per i Beni Archeologici di Roma (Italy); D. Lognoli, L. Palombi, Istituto di Fisica Applicata Nello Carrara, CNR (Italy)
- 9065 OZ **High resolution laser remote imaging innovative tools for preservation of painted surfaces: information from reflectance and fluorescence data (Invited Paper)** [9065-14]
R. Fantoni, M. Ferri de Collibus, M. Francucci, G. Fornetti, M. Guarneri, L. Caneve, F. Colao, L. Fiorani, A. Palucci, V. Spizzichino, ENEA (Italy)
- 9065 10 **Terahertz applications in cultural heritage: case studies** [9065-5]
D. Giovannacci, Lab. de Recherche des Monuments Historiques (France); D. Martos-Levif, Lab. de Recherche des Monuments Historiques, CNRS (France); G. C. Walker, The Univ. of Reading (United Kingdom); M. Menu, Ctr. de Recherche et de Restoration des Musées de France (France); V. Detalle, Lab. de Recherche des Monuments Historiques, CNRS (France)
- 9065 11 **Laser restoring the glass surface treated with acid-based paint** [9065-34]
A. V. Strusevich, Y. A. Poltaev, D. A. Sinev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

- 9065 12 **Laser removal of mold and foxing stains from paper artifacts: preliminary investigation** [9065-17]
D. Ciofini, I. Osticioli, Istituto di Fisica Applicata Nello Carrara, CNR (Italy); S. Micheli, L. Montalbano, Opificio Delle Pietre Dure (Italy); S. Siano, Istituto di Fisica Applicata Nello Carrara, CNR (Italy)
- 9065 13 **Dependence of Nd:YAG laser derusting and passivation of iron artifacts on pulse duration** [9065-4]
I. Osticioli, S. Siano, Istituto di Fisica Applicata Nello Carrara, CNR (Italy)

BIOMEDICAL LASER APPLICATIONS

- 9065 14 **Noninvasive express diagnostics of pulmonary diseases based on control of patient's gas emission using methods of IR and terahertz laser spectroscopy (Invited Paper)** [9065-22]
M. K. Starikova, Special Technologies, Ltd. (Russian Federation); A. A. Bulanova, E. B. Bukreeva, Siberian State Medical Univ. (Russian Federation); A. A. Karapuzikov, Special Technologies, Ltd. (Russian Federation); A. I. Karapuzikov, Institute of Laser Physics (Russian Federation); Y. V. Kistenev, Siberian State Medical Univ. (Russian Federation); V. M. Klementyev, Institute of Laser Physics (Russian Federation); D. B. Kolker, Special Technologies, Ltd. (Russian Federation); D. A. Kuzmin, Siberian State Medical Univ. (Russian Federation); O. Yu. Nikiforova, Y. Nu. Ponomarev, V.E. Zuev Institute of Atmospheric Optics (Russian Federation); I. V. Sherstov, A. A. Boyko, Special Technologies, Ltd. (Russian Federation)
- 9065 15 **Influence of the laser assisted fabricated 3D porous scaffolds from bioceramoplasts of micron and nano sizes on culture of MMSC** [9065-1]
I. Shishkovsky, P.N. Lebedev Physical Institute (Russian Federation) and Samara State Medical Univ. (Russian Federation); S. Volchkov, Samara State Medical Univ. (Russian Federation)
- 9065 16 **Nanosized carbon coating formed on different surfaces at the result of carbon emission from graphite under millisecond pulses of glass: Yb, Er laser** [9065-25]
N. A. Zulina, A. V. Belikov, A. V. Skrypnik, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

LASERS AND OPTICS RELATED RESEARCH

- 9065 17 **Broadband fiber amplifier like pumping source for fiber optic acoustic sensor** [9065-18]
E. F. Pinzón-Escobar, G. E. Sandoval-Romero, Univ. Nacional Autónoma de México (Mexico)
- 9065 18 **Laser fiber source implemented with a resonator Sagnac for fiber optic acoustic sensor** [9065-20]
G. E. Sandoval-Romero, E. F. Pinzón-Escobar, Univ. Nacional Autónoma de México (Mexico)

9065 19 **Optical discharge in laser cavity** [9065-12]
Y. Chivel, MerPhotonics (France)

Author Index

Symposium Committees

Honorary Chairs

Vladimir N. Vasiliev, NRU ITMO (Russian Federation)
Ivan A. Shcherbakov, GPI RAS (Russian Federation)

Symposium Chairs

Vadim P. Veiko, NRU ITMO (Russian Federation)
Vitaly I. Konov, GPI RAS (Russian Federation)

Program Committee Cochairs

B. Chichkov, Laser Zentrum (Germany)
S. Garnov, GPI RAS (Russian Federation)
A. Piqué, NRL (United States)
M. J. Soileau, CREOL, The College of Optics and Photonics,
University of Central Florida (United States)
K. Sugioka, RIKEN (Japan)
V. Veiko, NRU ITMO (Russian Federation)

Scientific Secretary

T. Vartanyan, NRU ITMO (Russian Federation)

Conference for Young Scientists, Engineers, and Students on Intensive Laser Actions and Applications

A. Fedorov, NRU ITMO (Russian Federation)
V. Gordienko, Moscow State University (Russian Federation)
G. Račiukaitis, Center for Physical Sciences and Technology (Lithuania)
S. Stafeev, NRU ITMO (Russian Federation)

Conference on Photophysics of Nano-scale Systems

F. Hubenthal, Universität Kassel (Germany)
T. Vartanyan, NRU ITMO (Russian Federation)

Conference on Intensive Laser Action in Biology and Medicine

G. Altshuler, Palomar Medical Technology Inc. (United States)
V. Bagratashvili, ILIT RAS (Russian Federation)
V. Khramov, NRU ITMO (Russian Federation)

Conference on Femtosecond Laser-Matter Interaction and Technologies

V. Gordienko, Moscow State University (Russian Federation)
T. Szörenyi, József Attila University (Hungary)
E. Yakovlev, NRU ITMO (Russian Federation)

Young Scientists Workshop on Terahertz Radiation Interaction with Matter

S. Garnov, GPI RAS (Russian Federation)
S. Kozlov, NRU ITMO (Russian Federation)
A. Shkurinov, Moscow State University (Russian Federation)

Workshop on Laser Cleaning and Artworks Conservation

V. Parfenov, St. Petersburg State Electrotechnical University
(Russian Federation)
A. Semerok, CEA, DEN, SEARS/LISL (France)
E. Shakhno, NRU ITMO (Russian Federation)

Workshop on Phase-Change Processes in Optical Materials and Memory Alloys

A. Kolobov, Nanoelectronics Research Institute, AIST (Japan)
N. Nikonorov, NRU ITMO (Russian Federation)

Workshop on High-Power Fiber Lasers Applications

A. Kourkov, GPI RAS (Russian Federation)
V. Serebryakov, NRU ITMO (Russian Federation)
S. Smirnov, Lasertech (Russian Federation)

Organizing Committee Cochairs

A. Allas, NRU ITMO (Russian Federation)
E. Brui, NRU ITMO (Russian Federation)
V. Komolov, NRU ITMO (Russian Federation)
E. Yakovlev, NRU ITMO (Russian Federation)

International Advisory Committee

S. Anisimov (Russian Federation)	P. Kashkarov (Russian Federation)
S. Ashmontas (Lithuania)	W. Kautek (Austria)
K. Fotakis (Greece)	I. Kazuyoshi (Japan)
S. Gaponov (Russian Federation)	Yu. Kivshar (Australia)
V. Gapontsev (Russian Federation)	V. Klimov (Russian Federation)
S. Garanin (Russian Federation)	O. Krokhin (Russian Federation)
A. Grigoryants (Russian Federation)	A. Luches (Italy)

I. Mijamoto (Japan)
V. Ochkin (Russian Federation)
V. Orlovich (Belarus)
V. Panchenko (Russian Federation)
R. Poprawe (Germany)
A. Sergeev (Russian Federation)

V. Soifer (Russian Federation)
M. Soskin (Ukraine)
F. Träger (Germany)
A. Zheltikov (Russian Federation)
L. Zhigiley (United States)
A. Ionin (Russian Federation)

International Program Committee

C. Arnold (United States)
F. Bachmann (Germany)
A. Caricato (Italy)
Y. Cheng (China)
O. Efimov (United States)
V. Detalle (France)
V. Gordienko (Russian Federation)
V. Gruzdev (United States)
H. Helvajian (United States)
P. Hermann (Canada)
F. Hubenthal (Germany)
N. Inogamov (Russian Federation)
Y. Jiang (China)
A. Kolobov (Japan)
V. Komolov (Russian Federation)
S. Kozlov (Russian Federation)
Y. Lu (United States)
B. Luk'yanchuk (Singapore)
M. Meunier (Canada)

I. Mihailescu (Romania)
A. Ostendorf (Germany)
V. Parfenov (Russian Federation)
G. Račiukaitis (Lithuania)
B. Rethfeld (Germany)
A. Semerok (France)
P. Serra (Spain)
I. Shiganov (Russian Federation)
A. Shkurinov (Russian Federation)
I. Smurov (France)
A. Sukhorukov (Russian Federation)
T. Szörenyi (Hungary)
M. Tribelsky (Russian Federation)
Y. Tsuboi (Japan)
G. Turichin (Russian Federation)
T. Vartanyan (Russian Federation)
E. Wintner (Austria)
E. Yakovlev (Russian Federation)

Organizing Committee

A. Fedorov
V. Khramov
V. Parfenov

A. Petrov
S. Sarnakov
V. Serebryakov

S. Stafeev
S. Smirnov
T. Vartanyan

Introduction

This volume presents selected papers of the International Symposium on Fundamentals of Laser-Assisted Micro- and Nanotechnologies (FLAMN-13).

This symposium continues in a new format from well-known traditional symposia, ILATA (Intensive Laser Actions and Technological Applications), consisting of LAMN (Laser-Assisted Microtechnologies) and LMI (Laser-Matter Interaction) conferences, originally organized in former Leningrad, USSR since the mid-1960s. Laser-assisted micro- and nanotechnology is one of the first and rapidly growing areas of research, development, and production.

The symposium was devoted to the wide spectrum of laser micro- and nanoprocessing, from physical fundamentals of different processes and their experimental demonstration, to the industrial set-ups and their realization. Topics covered by FLAMN-13 included theoretical and experimental aspects of laser-matter interaction applied to laser micro- and nanotechnology.










The sessions of FLAMN-13 were visited by over 350 participants including 200 speakers, approximately 80 of them from abroad (Australia, Austria, Belarus, China, France, Germany, Mexico, Hungary, Italy, Japan, Korea, Lithuania, Romania, Spain, Switzerland, United Kingdom, United States). About 225 papers were presented (110 orals, 115 posters); this volume contains 44 selected papers.

For convenience of readers, the papers in these proceedings are arranged into six topical sections:

- Section 1: Laser-matter interaction
- Section 2: Laser-assisted micro- and nanotechnologies
- Section 3: Laser-induced phase – structure modification
- Section 4: Laser cleaning and artworks conservation
- Section 5: Biomedical laser applications
- Section 6: Lasers and optics related research.

The program committee expresses its gratitude to all the institutions and persons who contributed to organizing, supporting, and holding the conference.

Personal thanks to the FLAMN-13 Cooperating and Sponsoring organization

			
ITMO	RFBR		GPI RAS
			
SPIE (publisher)	Dynasty Foundation	LSS of RF "Fundamentals of LAMN"	IT, optics & photonics
			
East-West-Science Center (OWWZ)		State Museum "Tzarskoje Selo"	

Vadim P. Veiko
Tigran A. Vartanyan