PROCEEDINGS OF SPIE

Pacific Rim Laser Damage 2014
Optical Materials for High Power Lasers

Takahisa Jitsuno
Jianda Shao
Wolfgang Rudolph
Editors

22–24 April 2014
Yokohama, Japan

Organized by
OPIC—Optics and Photonics International Council

Sponsored by
SPIE
SIOM—Shanghai Institute of Optics and Fine Mechanics
Chinese Academy of Sciences
QUANTEL (United States)
Nikon Corporation (Japan)
Okamoto Optical Works (Japan)
Plymouth Grating Laboratory (United States)

Cooperating Organizations
Osaka University (Japan)
SIOM—Shanghai Institute of Optics and Fine Mechanics
(China)
ILT—Institute for Laser Technology (Japan)
LSJ—The Laser Society of Japan (Japan)
JLPS—Japan Laser Processing Society (Japan)

Published by
SPIE

Volume 9238

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 *Pacific Rim Laser Damage 2014: Optical Materials for High-Power Lasers*, edited by Takahisa Jitsuno, Jianda Shao, Wolfgang Rudolph, Proceedings of SPIE Vol. 9238 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X
ISBN: 9781628413014

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

Printed in the United States of America.

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

SPIE Digital Library
SPIEDigitalLibrary.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

DEFECTS, CONTAMINATION, POLISHING AND SURFACE DAMAGE

POSTER SESSION

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Conference Committee

Conference Chairs

Takahisa Jitsuno, Osaka University (Japan)
Jianda Shao, SIOM—Shanghai Institute of Optics and Fine Mechanics (China)
Wolfgang Rudolph, University of New Mexico (United States)

Organizing Committee

Co-chairs

Kunio Yoshida, Okamoto Optical Works (Japan)
Masataka Murahara, Tokai University (Japan)
Shinji Motokoshi, Institute for Laser Technology (Japan)

Members

Hisanori Fujita, Osaka University (Japan)
Hidetsugu Yoshida, Osaka University (Japan)
Jyunji Kawanaka, Osaka University (Japan)
Hajime Nishioka, University of Electro-Communications (Japan)
Tomozumi Kamimura, Osaka Institute of Technology (Japan)
Norihiko Yamamura, Showa Optronics Company, Ltd. (Japan)
Kiyoshi Suda, Sigma Koki Company, Ltd. (Japan)
Minako Azumi, Nikon Corporation (Japan)
Atsushi Yokotani, Miyazaki University (Japan)
Ryo Yasuhara, National Institute for Fusion Science (Japan)

Conference Program Committee

Norbert Kaiser, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)
Efim A. Khazanov, Institute of Applied Physics (Russia)
Zunqi Lin, SIOM—Shanghai Institute of Optics and Fine Mechanics (China)
Yongfeng Lu, University of Nebraska-Lincoln (United States)
Alexander A. Manenkov, General Physics Institute (Russia)
Richard Moncorgé, ENSICAEN (France)
Jean-Yves Natoli, Institute Fresnel (France)
Valdas Sirutkaitis, Vilnius University (Lithuania)
Christopher J. Stolz, Lawrence Livermore National Laboratory (United States)
Koji Sugioka, RIKEN (Japan)

Takunori Taira, Institute for Molecular Science (Japan)
Mauro Tonelli, Universitá degli Studi di Pisa (Italy)
Eric W. Van Stryland, CREOL, University of Central Florida (United States)
Zhouling Wu, Rx Technnology, Ltd. (China)
Xiaomin Zhang, China Academy of Engineering Physics (China)
Jiping Zou, École Polytechnique (France)

Session Chairs

Plenary Session
John C. Bellum, Sandia National Laboratories (United States)

Joint Session
Takahisa Jitsuno, Osaka University (Japan)

High Power Laser Damage
Jianda Shao, SIOM—Shanghai Institute of Optics and Fine Mechanics (China)

Nonlinear Crystals and Lasers
Shinji Motokoshi, Institute for Laser Technology (Japan)

High Laser Damage Resistant Coating
Kunio Yoshida, Okamoto Optical Works (Japan)

Defects, Contamination, Polishing and Surface Damage
Tomosumi Kamimura, Osaka Institute of Technology (Japan)
Yuanan Zhao, SIOM—Shanghai Institute of Optics and Fine Mechanics (China)

Introduction

The Pacific Rim Laser Damage (PLD) conference was initiated by Prof. Jianda Shao of Shanghai Institute of Optics and Fine Mechanics, China in 2009. This conference was held as a satellite meeting of the SPIE Laser Damage Symposium at Boulder. The purpose of this meeting is to communicate with researchers in the field of laser damage and related phenomena especially in the Pacific Rim area. Normally, the PLD meeting is held biyearly in Shanghai, but due to special request of Prof. Shao, the PLD'14 meeting was held in Japan as a part of the OPIC conference.

PLD'14 included 7 sessions:

1. Joint Session
   This joint session was proposed by Prof. T. Taira, (Conference Chair of LIC 2014, of the Institute for Molecular Science, Japan), because LIDT is an important factor for laser ignition devices. This session included 5 talks on laser process and damage phenomena.
2. Plenary Session
   This session included Conference Co-Chairs (Prof. J. Shao and Prof. T. Jitsuno), with a talk about revolutionary grating fabrication from Plymouth Grating Laboratory (D. Smith).
3. High Power Laser Damage
   This session included 5 talks on high energy and high peak power laser systems.
4. Poster Session
   The Poster session included 8 reports on LIDS, laser systems and optical materials.
5. Nonlinear Crystals and Laser
   This session included reports on nonlinear crystal and laser amplifier.
6. High Laser Damage Resistant Coating
   Coating, material, and damage detection were reported.
7. Defect, Contamination, Polishing and Surface Damage
   10 papers on the fundamental research of this subject were reported.

We had 20 papers in PLD'14. The number of registered attendees for PLD'14 was 52, but we had many additional attendees from other OPIC conferences. PLD'14 was a small conference, but we had useful discussions and mutual communication. The special contributions of SPIE and SIOM should be mentioned. This conference is supported by the Chinese Academy of Science as a Japan-China Bilateral Forum. It is also a part of activities in the Project for Creation of Research Platform and Sharing of Advanced Research Infrastructure promoted by the Ministry of Education of the Japanese Government.

Takahisa Jitsuno
Jianda Shao
Wolfgang Rudolph