

PROCEEDINGS OF SPIE

***High-Power Laser Materials
Processing: Applications,
Diagnostics, and Systems XIII***

**Stefan Kaierle
Klaus R. Kleine**
Editors

**31 January – 1 February 2024
San Francisco, California, United States**

Sponsored and Published by
SPIE

Volume 12878

Proceedings of SPIE 0277-786X, V. 12878

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

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *High-Power Laser Materials Processing: Applications, Diagnostics, and Systems XIII*, edited by Stefan Kaieler, Klaus R. Kleine, Proc. of SPIE 12878, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510670167

ISBN: 9781510670174 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2024 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

**SPIE. DIGITAL
LIBRARY**

SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

v *Conference Committee*

SYSTEMS

- 12878 02 **Optical tools for laser machining along six orders of magnitude (Invited Paper)** [12878-1]
- 12878 03 **Design of a processing-head for AI-optimized welding and cutting** [12878-2]
- 12878 04 **An attenuator arranged in a V-shape beam splitter to make a balanced ring profile** [12878-3]
- 12878 05 **Characterization of multiclad fibers: approaches to measure the beam divergence angle and its degradation in the fiber** [12878-4]
- 12878 06 **High-power laser material processing utilizing high-speed combined motion of scanner and linear axes system** [12878-5]

JOINING AND WELDING I

- 12878 08 **Quality-assured laser transmission welding of additively manufactured components with the support of an expert system** [12878-10]
- 12878 09 **Characterizing the effect of the vapor plume on laser beam characteristics during laser beam welding** [12878-12]

HIGH POWER ULTRA SHORT PULSE PROCESSING

- 12878 0D **Spectral selectivity and blackening through direct-write femtosecond micromachining** [12878-20]

PROCESS MONITORING AND CONTROL

- 12878 0E **Joint quality assessment by machine learning using characterized surface thermal radiation images of laser welding process** [12878-22]
- 12878 0F **Influence of flow rate and gas type with a novel nozzle capable of simultaneously gas flow and suction on weld quality in laser welding** [12878-23]
- 12878 0G **Process monitoring during interaction of laser with AlMg5 and Ti6Al4V alloys using spectroscopy and high-speed imaging for laser manufacturing** [12878-24]

- 12878 0H **Thermal evaluation of a laser microdrilling process for thin CFRP-laminates** [12878-26]
- 12878 0I **Multipoint thermal monitoring of silicon wafer under processing utilizing a spectrally shaped supercontinuum source** [12878-27]
- 12878 0J **Non-destructive quality testing with photoacoustic imaging and optical coherence tomography** [12878-28]

POSTER SESSION

- 12878 0L **Investigation of microstructure and cutting characteristics on cement-based materials after high-power laser cutting** [12878-32]

DIGITAL POSTER SESSION

- 12878 0O **Research on laser and electrochemical synchronous composite machining of small holes** [12878-29]
- 12878 0P **Global shutter depth profiling of molten pool and keyhole during laser processing using core-array fiber** [12878-35]