

PROCEEDINGS OF SPIE

Optical Trapping and Optical Micromanipulation XVIII

Kishan Dholakia
Gabriel C. Spalding
Editors

1–5 August 2021
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 11798

Proceedings of SPIE 0277-786X, V. 11798

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

Optical Trapping and Optical Micromanipulation XVIII, edited by Kishan Dholakia, Gabriel C. Spalding,
Proc. of SPIE Vol. 11798, 1179801 · © 2021 SPIE · CCC code: 0277-786X/21/\$21 · doi: 10.1117/12.2606421

Proc. of SPIE Vol. 11798 1179801-1

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 *Optical Trapping and Optical Micromanipulation XVIII*, edited by Kishan Dholakia, Gabriel C. Spalding, Proc. of SPIE 11798, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510644342

ISBN: 9781510644359 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2021 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

VIRUS AND SINGLE-MOLECULE BIOPHYSICAL STUDIES AND TECHNOLOGIES

- 11798 04 **Using a single molecule optical trapping assay and FRET to reveal the mechanism of transduction by the molecular motor myosin (Invited Paper)** [11798-2]

USING THE PHOTONIC TOOLBOX TO STUDY CELLS AND THEIR ORGANELLES

- 11798 07 **Measuring bacterial attachment forces** [11798-8]
- 11798 08 **A method to study cellular injuries using optical trapping combined with laser-induced shockwaves under quantitative phase microscope** [11798-5]
- 11798 09 **In vitro influence of 520 nm diode laser irradiation on red blood cell spontaneous aggregation studied by optical tweezers and light microscopy** [11798-6]

OPTICALLY DRIVEN MICRORHEOLOGY, MECHANOBIOLOGY, AND MICROMECHANICAL PROPERTIES

- 11798 0D **Microrheology over a broad frequency range probing multiple-sinusoid oscillating optical tweezer** [11798-12]

APPROACHES TO OPTICAL FORCE AND MOMENTUM MEASUREMENT

- 11798 0F **Random number extraction from optically trapped Brownian oscillator using an iterative algorithm** [11798-15]

STATISTICAL MECHANICS OF SMALL SYSTEMS

- 11798 0L **Trajectory control using an information engine** [11798-19]
- 11798 0M **Nanofluidic rocking Brownian motors for multi-channel separation of spherical nanoparticles with nanometer scale resolution** [11798-21]
- 11798 0N **High-Q phonon laser based on energy-dependent feedback (Invited Paper)** [11798-22]

OPTICALLY BOUND MATTER

11798 0Q **Optically bound matter levitated in vacuum** [11798-25]

CAVITY OPTOMECHANICS; TOWARD (OR IN) THE QUANTUM LIMIT OF OPTO-MECHANICS

11798 0R **Coupling trapped cold neutral atoms to a microring photonic circuit** [11798-27]

RADIATION PRESSURE, TRACTOR BEAMS, AND SOLAR SAILS

11798 0Z **Radiation pressure on bi-grating and axicon diffractive beam-riding light sails** [11798-42]

11798 10 **Electromagnetic force and torque derived from a Lagrangian in conjunction with the Maxwell-Lorentz equations** [11798-72]

SYSTEMS WITH BROKEN SYMMETRY, INCLUDING OPTICAL ANGULAR MOMENTUM

11798 1B **Multipolar origin of electromagnetic transverse force resulting from TE/TM waves interference** [11798-44]

11798 1D **Generation of pitch rotational torque wrench using two-beam optical tweezers on a birefringent particle** [11798-46]

11798 1E **A study of the rotational spin-Hall effect in higher order Gaussian beams** [11798-47]

NEXT-GENERATION FABRICATION TECHNOLOGIES, INCLUDING PHOTONIC DEVICES FOR OPTICALLY INDUCED FORCES

11798 1L **Optical adhesion of photocurable emulsion droplets using laser trapping** [11798-55]

NEAR-FIELD MICROMANIPULATION, PLASMONIC, AND NANOPARTICLE TRAPPING I

11798 1P **Trapping and manipulation on a chip: from subwavelength particle manipulation to chemical synthesis (Invited Paper)** [11798-60]

11798 1Q **Probing optimum applied power for extraordinary acoustic Raman spectroscopy** [11798-59]

NEAR-FIELD MICROMANIPULATION, PLASMONIC, AND NANOPARTICLE TRAPPING II

- 11798 1U **Symmetric and isotropic micro/nanorotors driven by a plane-polarized gaussian laser beam**
[11798-64]
- 11798 1X **Optical trapping at high temperature** [11798-150]

NONLINEAR OPTICAL RESPONSES MEDIATED THROUGH FORCES (TRANSLATION, ELECTROSTRICTION)

- 11798 1Y **On the spatiotemporal control with a single beam femtosecond optical tweezer** [11798-68]
- 11798 1Z **Optical trapping of gain-assisted plasmonic nano-shells: theoretical study of the optical forces in a pumped regime below the emission threshold** [11798-69]
- 11798 2I **Upconversion nanocrystal emission rate enhancement using double nanoholes** [11798-71]
- 11798 2J **Extraordinary nonlinear response of nanoparticles in double nanohole optical tweezers (Invited Paper)** [11798-73]

ALTERNATIVE AND HYBRID FORCE SYSTEMS

- 11798 24 **Manipulating aqueous droplets by light-induced virtual electrodes** [11798-75]
- 11798 25 **Structuring acoustic fields for particle manipulation** [11798-79]

OPTICAL MANIPULATION OF MATTER THROUGH GASEOUS MEDIA

- 11798 26 **Preferred locations in a laser beam for photophoretic trapping of microscopic particles**
[11798-86]
- 11798 27 **Anharmonic aerosol particle dynamics at Mie resonances in modulated counter-propagating optical tweezers** [11798-84]

OPTICAL TWEEZERS COUPLED WITH NOVEL FORMS OF MICROSCOPY

- 11798 29 **Raman optical tweezers for microplastic pollution identification in the surface waters of Okinawa** [11798-80]
- 11798 2A **Examining HIV infected cells using optical trapping and Raman spectroscopy** [11798-81]

STUDIES OF DYNAMICAL BIOPHYSICAL SYSTEMS

- 11798 2D **Clustering of Janus particles in an optical potential driven by hydrodynamic fluxes** [11798-88]
- 11798 2E **Generation of active motion from optically trapped upconverting nanoparticles** [11798-89]

POSTER SESSION

- 11798 2H **Laser induced shockwave paired with FRET to study neuronal responses to shear stress**
[11798-96]
- 11798 2J **Three-dimensional optical bottle beams for axial optical tweezers based on interference of Bessel beams** [11798-91]
- 11798 2P **Optical trapping forces on nanoparticles in nonlinear medium under femtosecond pulsed excitation** [11798-100]
- 11798 2U **Behind optothermal trapping of photothermally-induced microbubbles** [11798-147]
- 11798 2V **Migration of absorbing nanoparticles through temperature gradients** [11798-106]