



A new nano-biophotonics toolbox

Glückstad, Jesper; Bañas, Andrew Rafael; Palima, Darwin

Publication date:
2013

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Glückstad, J., Bañas, A. R., & Palima, D. (2013). *A new nano-biophotonics toolbox*. Abstract from 11th Mediterranean workshop and topical meeting: Novel optical materials and applications, Cetraro, Italy.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*11th Mediterranean Workshop and Topical Meeting
"Novel Optical Materials and Applications"*

NOMA

2013



ABSTRACTS

In alphabetical order of speaker's names

Program Committee Board

P. Barois (France)
T. Bunning (USA)
G. Cipparrone (Italy)
V. Degiorgio (Italy)
C. Denz (Germany)
C. Flytzanis (France)
M. Kauranen (Finland)
I. C. Khoo (USA)
D. Psaltis (Switzerland)
H. Rubinsztein-Dunlop (Australia)
F. Simoni (Italy)

Organisers

C. Umeton (Chairman)
I.C. Khoo (Program Co-Chair)
F. Simoni (Program Co-Chair)

Local Organizing Committee

R. Caputo, A. De Luca,
C. Umeton.

*Grand Hotel San Michele
Cetraro - Italy, June 10 - 15, 2013*

A new nano-biophotonics toolbox

Jesper Glückstad

Andrew Banas, Darwin Palima

DTU Fotonik, Technical Univ. Denmark

The science fiction inspired shrinking of macro-scale robotic manipulation and handling down to the micro- and nano-scale regime open new doors for exploiting the forces and torques of light for micro- and nanobiologic probing, actuation and control. A generic approach for optimizing light-matter interaction on these scales involves the combination of optimal light-sculpting with the use of optimized shapes in micro-robotics structures. Micro-fabrication processes such as two-photon photo-polymerization offer three-dimensional resolutions for creating custom-designed monolithic microstructures that can be equipped with optical trapping handles for convenient mechanical control using only optical forces. These microstructures can be effectively handled with simultaneous top- and side-view on our BioPhotonics Workstation to undertake six-degree-of-freedom optical actuation of two-photon polymerised microstructures equipped with features easily entering the submicron-regime. Aided by European collaborators who fabricated test structures with built-in waveguides for us, we were able to put the idea of optically steerable freestanding waveguides – coined: wave-guided optical waveguides - to the test using our BioPhotonics Workstation. We also propose using these techniques for generating two-photon real-time spatially sculpted light for the strongly emerging areas of neurophotonics and optogenetics.

[1] P. Rodrigo, L. Kelemen, D. Palima, C. Alonzo, P. Ormos, and J. Glückstad, "Optical

microassembly platform for constructing reconfigurable microenvironments for biomedical studies,\" Optics Express 17, 6578-6583 (2009).

[2] J. Glückstad, "Sorting particles with light," Nature Materials 3, 9-10 (2004).

[3] J. Glückstad, "Optical manipulation: Sculpting the object," Nature Photonics 5, 7-8 (2011).

[4] E. Papagiakoumou, F. Anselmi, A. Begue, V. de Sars, J. Glückstad, E. Isacoff, V. Emiliani, "Scanless two-photon excitation of channelrhodopsin-2," Nature Methods 7, 848-854 (2010).

[5] D. Palima, A. R. Bañas, G. Vizsnyiczai, L. Kelemen, P. Ormos, and J. Glückstad, \"Wave-guided optical waveguides,\" Opt. Express 20, 2004-2014 (2012).

[6] D. Palima and J. Glückstad, "Gearing up for optical microrobotic manipulation: mechanical actuation of synthetic microstructures by optical forces," Laser & Photonics Reviews (2013).

[7] H. Ulriksen, J. Thøgersen, S. Keiding, I. P.-Nielsen, J. Dam, D. Palima, H. Stapelfeldt, J. Glückstad, \"Independent trapping, manipulation and characterization by an all-optical biophotonics workstation,\" J. Eur. Opt. Soc-Rapid 3, 08034 (2008).

mail to: jesper.gluckstad@fotonik.dtu.dk