applied optics

Latin America Optics and Photonics 2022: introduction to the feature issue

ANDERSON S. L. GOMES,[1,*] EUNEZIO THOROH DE SOUZA,[2] AND DENISE M. ZEZELL[3]

[1]Department of Physics, Universidade Federal of Pernambuco, Cidade Universitaria, Recife, 50640-901, PE, Brazil
[2]Mackenzie School of Engineering, Mackenzie Presbyterian University, Rua da Consolação, 896, 01302-907 São Paulo, Brazil
[3]Center for Lasers and Applications, Nuclear and Energy Research Institute IPEN-CNEN, Av. Prof. Lineu Prestes, 2242, Sao Paulo, CEP 05508-000, SP, Brazil
*andersonslgomes@gmail.com

Received 6 March 2023; posted 6 March 2023; published 9 March 2023

The 2022 Latin America Optics and Photonics Conference (LAOP 2022), the major international conference sponsored by Optica in Latin America, returned to Recife, Pernambuco, Brazil, after its first edition in 2010. Held every two years since (except for 2020), LAOP has the explicit objective to promote Latin American excellence in optics and photonics research and support the regional community. In the 6th edition in 2022, it featured a comprehensive technical program with recognized experts in fields critical to Latin America, highly multidisciplinary, with themes from biophotonics to 2D materials. The 191 attendees of LAOP 2022 listened to five plenary speakers, 28 keynotes, 24 invited talks, and 128 presentations, including oral and posters.

https://doi.org/10.1364/AO.489414

1. INTRODUCTION

This special issue of Applied Optics consists of 20 papers by attendees of the 2022 Latin America Optics and Photonics Conference (LAOP 2022), held in Recife, Pernambuco, Brazil, from August 7th to 11th 2022. The scientific themes cover a diversity of categories, including fiber optics, fiber sensors, and optical communications; imaging systems, image processing, and displays; instrumentation and measurements; lasers, optical amplifiers, and laser optics; materials; medical optics, microscopy, and biotechnology; nonlinear optics; optical design and fabrication; optical devices, sensors, and detectors; spectroscopy and surface optics and plasmonics. In what follows, we highlight some of the 20 papers [1–20] in this special issue, and highly recommend the readers to glance through the whole issue to view other intereting articles.

Breast cancer (BC) diagnosis is still a great challenge, particularly for fast and accurate result. Farooq *et al*. [1] addressed those challenges using machine learning tools to facilitate an accurate classification of BC subtypes with high action-ability and accuracy. They proposed an algorithm-based method to distinguish computationally BC cell lines, based on coupling K-neighbors classifier (KNN) with neighborhood components analysis (NCA), and hence, NCA-KNN enabled to identify BC subtypes without increasing model size as well additional computational parameters. By incorporating FTIR imaging data, they showed the classification accuracy, specificity and sensitivity improve respectively 97.5%, 96.3% and 98.2%, even at very low co-added scan and short acquisition time. Reyes-Alberto *et al*. [2] propose a method to determine the extinction index of the fluorescing samples that can be applied to fluorescent media with additional absorption other than by the fluorophore, as well as in media with a prevalent forward scattering, such as some biological ones. For that, several spectra were taken at different exciting light angles of incidence, with the use of a simplified model. The measured extinction index at the emission wavelengths was larger than the extinction index at the excitation wavelength, which is the opposite of what one might expect from measuring the absorption spectrum of the medium by using a spectrofluorometer.

A new pressure-sensitive platform with 16 pre-established sensing cells was demonstrated by Carvalho *et al*. [3] using only five in-series macro-bend optical fiber sensors. The platform proved to be capable of determining the magnitude and location of a localized pressure applied on its surface with 94% of accuracy. The system response had minimal influence of temperature changes due to silicone encapsulation and operates in the visible spectral window, which will allow to explore smartphone technology for future applications. Luz *et al*. [4] demonstrated a new optically switched photon-avalanche process, whose underlying physical mechanism is the additional heating of the particles due to the phonon emissions from the Nd^{3+} relaxation pathways when exciting at 808 nm. As a proof-of-concept, $NdAl_3(BO_3)_4$ particles excited at 1064 nm were used below the excitation power threshold and subsequently with an auxiliary beam at 808 nm. These results have potential applications in controlled heating and remote temperature sensing. Aguirre-Aguirre *et al*. [5] presented an alternative method of fabrication and characterization of ophthalmologic biconvex spherical

1559-128X/23/080LA1-02 Journal © 2023 Optica Publishing Group

and aspherical lenses with diameters ranging from 25 mm to 50 mm, using additive technology from a Formlabs Form 3 3D printer. Fabrication errors were <2.47% for the radius of curvature. Functionality of lenses and fabrication method was verified by showing eye fundus images. Among the advantages of the method, different lenses with complex shapes can be fabricated simultaneously and there is no need of additional molds and glass, reducing fabrication time and costs. CubeSat nanosatellites are being used as a standard for developing low-weight and small-sized instrument to monitor and observe the surface of the Earth. In this sense, Morales-Norato *et al.* [6] developed a compact optical system to acquire spectral images from a CubeSat standard satellite at the height of 550 km. Optical simulations using ray tracing software validated the system. The classification p erformance o f t he o ptical system and land cover classification w as c ompared o n a r eal remote sensing application, showing that the proposed optical system achieves a compact instrument, operating at a spectral range from 450 nm to 900 nm discretized on 35 spectral bands. The optical system has an overall f-number of 3.41 with a ground sampling distance of 52.8 m and a swath of 40 km. Random lasers have actively studied in the last three decades, and Camara *et al.* [7] reported on random lasing in neodymium doped alumina lead–germanate (GPA) glass powder. In yet another work exploiting random lasers, Araújo *et al.* [8] proposed and demonstrated proposes a rapid detection photonic method to evaluate the protein content in skim milk based on the intensity of the random laser emission. As another example in 2D materials, Barreto *et al.* [9] have produced multilayer graphene (MLG) thin films were produced on a cobalt-buffer layer by a sputtering technique. The authors analyzed the transmittance at 980 nm as a function of input power using a continuous-wave diode laser to show that the obtained MLG films present large nonlinear absorption and can be used as optical limiters. Another interesting article is reported by Andrade *et al.* [10] describing the implementation of a fiber-optics a nd visible light communication (VLC)-based flexible optical distribution network for beyond the fifth g eneration o f m obile networks (B5G) applications. As a proof of concept, the authors describe their successful deployment of a 5G hybrid A-RoF/VLC system without using pre-/post-equalization, digital pre-distortion, or individual filters for each color, by means of using a dichroic cube filter at the receiver side.

The Editors of this feature issue thank all the authors for their participation and submission, as well as the reviewers who dedicate their time to help in the peer review process.

REFERENCES

1. S. Farooq, M. Del-Valle, M. O. dos Santos, S. N. dos Santos, E. S. Bernardes, and D. M. Zezell, "Rapid identification of breast cancer subtypes using micro-FTIR and machine learning methods," Appl. Opt. **62**, C80–C87 (2023).
2. M. Reyes-Alberto, A. García-Valenzuela, and E. Gutierrez-Herrera, "Method for measuring the extinction coefficient of fluorescing media within the emission band," Appl. Opt. **62**, C106–C114 (2023).
3. V. de Carvalho, A. E. Lazzaretti, J. L. Fabris, and M. Muller, "Pressure-sensitive platform based on multiplexed in-series macro-bend optical fiber sensors," Appl. Opt. **62**, C1–C7 (2023).
4. D. F. Luz, R. F. da Silva, C. V. T. Maciel, G. Soares, E. P. Santos, C. Jacinto, L. J. Q. Maia, B. C. Lima, and A. L. Moura, "Optical switching a photon-avalanche-like mechanism in $NdAl_3(BO_3)_4$ particles excited at 1064 nm by an auxiliary beam at 808 nm," Appl. Opt. **62**, C30–C37 (2023).
5. D. Aguirre-Aguirre, D. Gonzalez-Utrera, B. Villalobos-Mendoza, and R. Díaz-Uribe, "Fabrication of biconvex spherical and aspherical lenses using 3D printing," Appl. Opt. **62**, C14–C20 (2023).
6. D. Morales-Norato, S. Urrea, H. Garcia, J. Rodriguez-Ferreira, E. Martinez, H. Arguello, A. Silva-Lora, R. Torres, I. F. Acero, F. L. Hernández, L. P. Cárdenas, and S. Rincón, "Hyperspectral camera as a compact payload architecture for remote sensing applications," Appl. Opt. **62**, C88–C98 (2023).
7. J. G. Câmara, D. M. da Silva, L. R. P. Kassab, and C. B. de Araújo, "Random laser emission from neodymium doped alumina lead–germanate glass powder," Appl. Opt. **62**, C59–C63 (2023).
8. S. dos Santos Araújo, M. V. A. Prado, L. M. G. Abegão, A. A. C. Pagani, J. J. Rodrigues, S. C. Zílio, and M. A. R. C. Alencar, "Using a random laser to measure the content of protein in skim milk," Appl. Opt. **62**, C53–C58 (2023).
9. L. M. M. Barreto, D. M. da Silva, A. D. Santos, K. Araki, C. B. de Araújo, and L. R. P. Kassab, "Optical limiting in multilayer graphene films on a cobalt buffer-layer produced by the sputtering technique," Appl. Opt. **62**, C122–C127 (2023).
10. T. P. V. Andrade, L. C. de Souza, E. S. Lima, and A. C. Sodré, "Demonstration of a hybrid A-RoF/VLC system for beyond 5G applications," Appl. Opt. **62**, C115–C121 (2023).
11. K. Y. de Souza e Silva, C. M. C. Falcão, L. O. Fernandes, and A. S. L. Gomes, "Exploiting optical coherence tomography to evaluate wear in spiral dental polishing systems," Appl. Opt. **62**, C8–C13 (2023).
12. P. R. N. Marciano, D. V. N. Coelho, M. J. Pontes, and M. E. V. Segatto, "Analysis of a photonic integrated circuit for passive optical network for 5G NR," Appl. Opt. **62**, C71–C79 (2023).
13. H. Garcia, J. Bacca, B. Wohlberg, and H. Arguello, "Calibration reinforcement regularizations for optimized snapshot spectral imaging," Appl. Opt. **62**, C135–C145 (2023).
14. M. A. Jucá, I. V. C. Pereira, P. C. G. Spelta, and A. B. dos Santos, "Identification of external media using a long-period grating and optical time-domain reflectometry," Appl. Opt. **62**, C43–C48 (2023).
15. A. V. F. Zuffi, J. R. dos Santos, E. P. Maldonado, N. D. Vieira, and R. E. Samad, "Femtosecond laser-plasma dynamics study by a time-resolved Mach–Zehnder-like interferometer," Appl. Opt. **62**, C128–C134 (2023).
16. A. Bereczki and N. U. Wetter, "Dynamic stable ring resonator for high-power continuous single-frequency lasers: conditions for a compact resonator," Appl. Opt. **62**, C38–C42 (2023).
17. F. M. Prado, T. J. Franco, T. de Almeida Vieira, and N. U. Wetter, "High-power Nd:YLF four-level lasers with 68% slope efficiency," Appl. Opt. **62**, C49–C52 (2023).
18. E. S. Gonçalves and H. L. Fragnito, "Graphene as an inhomogeneously broadened two-level saturable absorber," Appl. Opt. **62**, C99–C105 (2023).
19. A. S. Laia, J. Felix N., A. C. Brandão-Silva, J. J. Rodrigues, M. A. C. dos Santos, N. O. Dantas, A. C. A. Silva, and M. A. R. C. Alencar, "Obtaining the spectroscopic quality factor through the luminescent thermometry in $50Li_2O{\cdot}45B_2O_3{\cdot}5Al_2O_3$ glasses doped with Nd^{3+} and fluorides," Appl. Opt. **62**, C21–C29 (2023).
20. H. Ferrari, V. Herrero, C. J. Zapata-Rodríguez, and M. Cuevas, "Graphene surface modes enabling terahertz pulling force," Appl. Opt. **62**, C64–C70 (2023).