PROCEEDINGS OF SPIE

Next-Generation Spectroscopic Technologies XII

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Editors

15–17 April 2019
Baltimore, Maryland, United States

Sponsored and Published by
SPIE

Volume 10983

Proceedings of SPIE 0277-786X, V. 10983

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

Next-Generation Spectroscopic Technologies XII, edited by Richard A. Crocombe, Luisa T. M. Profeta, Abul K. Azad,
Proc. of SPIE Vol. 10983, 1098301 · © 2019 SPIE · CCC code: 0277-786X/19/$18 · doi: 10.1117/12.2537414

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Please use the following format to cite material from these proceedings:
Author(s), "Title of Paper," in *Next-Generation Spectroscopic Technologies XII*, edited by Richard A. Crocombe, Luisa T. M. Profeta, Abul K. Azad, Proceedings of SPIE Vol. 10983 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510626317
ISBN: 9781510626324 (electronic)

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
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Introduction

The past 25 years have seen a massive investment in photonics, electronics, and MEMS aimed at developing new telecommunications capabilities, innovative consumer products and advanced sensing. This has led to advances in miniature optics, light sources, tunable filters, array detectors, fiber optic sensors, and a range of other photonic devices across the whole electromagnetic spectrum; along with technologies for their mass production. Similarly, in recent years, there have been remarkable developments in handheld consumer electronics, especially mobile devices ("smartphones"). Today's devices contain advances in RF technology, processors, displays, operating systems, user interfaces, memory, Bluetooth, Wi-Fi, GPS, cameras, accelerometers, etc. These technologies are now the base of next-generation handheld scientific spectroscopic instruments; both single-point and hyperspectral imaging. Spectroscopy-based systems are now making critical judgments in environments and applications that were unreachable twenty years ago; from hazardous materials to the operating theater, and from field geologists to customs and border personnel.

Novel designs enable very compact spectrometers and imagers, suitable for use on airborne platforms, including drones. The latest developments have driven the cost of hyperspectral imagers in the silicon detector region down dramatically and are looking toward incorporating them in smartphones. The concurrent improvements in analytical theory, data analysis methods, algorithms, and the power of portable processors enable instrument designers to 'put a PhD scientist in the box' and empower field spectroscopic devices to give specific actionable answers. A very recent development is the incorporation of photonic and spectroscopic devices into consumer devices like washing machines, ovens and personal care products.

This conference focused on advanced technologies for spectroscopic instrumentation, particularly the ultraviolet-visible, infrared, near-infrared, terahertz and Raman molecular techniques, but also included advances enabling miniature and portable spectrometers across the electromagnetic spectrum. Another critical topic area discussed was materials development relevant to shrinking the physical sizes of technologies enabling these applications.

This conference premiered at Optics East 2007 in Boston, Massachusetts (United States), and it is currently part of the "Materials and Devices" track with the Defense + Commercial Sensing (DCS) meeting. Since 2017, the conference has included special session on terahertz technologies and applications. The conference is now rotating between three sites: Baltimore, Maryland; Anaheim, California; and Orlando, Florida. The 2019 conference was held in Baltimore, Maryland spanning

three days and was divided into sessions focusing on Smartphone Spectroscopy, New Technologies, Spectroscopy in CBRNE Applications, Advances in Raman Spectroscopy, and Technologies and Applications. In all, 37 papers were presented, 18 of which are included in this volume.

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