

# Biosensing platforms based on liquid-crystal/glass-substrate frameworks

Wei Lee\*

*College of Photonics, National Chiao Tung University, Tainan 71150, Taiwan*

[Contact E-mail: [wlee@nctu.edu.tw](mailto:wlee@nctu.edu.tw)]

Microscopic texture observation has long been the core technique in liquid crystal (LC)-based biosensing or immunodetection. The working principle stems from the dark-to-bright texture change induced by the disruption of the initially homeotropic alignment in nematic bulks in the presence of biomolecules [1]. One of the drawbacks of this observational scheme, which requires a polarizing optical microscope as the key tool, is the difficulty in quantitative analysis [2]. In this presentation, I shall report on our recent development of label-free bioassays with high-birefringence nematic [3,4], dual-frequency nematic [5], cholesteric [6], smectic [7], blue-phase [7], dye [8] and dye-doped LCs [9] as the probing elements. Highlighted will be our attempts to go beyond the texture-observation method, extending to the spectral [6–9], electrical [10] and dielectric [5] data analysis of a model protein—bovine serum albumin (BSA)—or a cancer biomarker (CA125) commonly used in clinical cancer screening. In addition to the results involving the typical cell framework, revealed will be the latest findings using LC on a single substrate as a simplified biosensing platform.

## References

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## Speaker Biography

**Wei Lee** received his M.S. degree in electro-optical engineering from National Chiao Tung University (NCTU), Taiwan, in 1987 and his Ph.D. degree in physics from the University of Alabama at Birmingham (UAB), AL, in 1993. He was a lecturer at UAB between 1993 and 1994 and a full-time visiting assistant professor of physics and astronomy at the University of Toledo, OH, between 1994 and 1997. Dr. Lee was affiliated with Chung Yuan Christian University, Taiwan for the following 14.5 years. He was a visiting professor of optics at CREOL of the University of Central Florida, FL, between 2009 and 2010, and a visiting scholar at the Kirensky Institute of Physics, Siberian Branch of the Russian Academy of Sciences, Russia, in 2010, 2015 and 2018. Prof. Lee was Director of the Institute of Imaging and Biomedical Photonics, NCTU, between 2012 and 2015. He served on the editorial board of *Optical Materials Express* as a founding associate editor for two terms from 2011 through 2016 and an executive committee member—Optical Groups Liaison—of the Optical Materials Study Group, the Optical Society (OSA), from 2015 through 2017. He was President of the Taiwan Liquid Crystal Society for two terms (2014–2017), served as Chair of ACLC 2017, Tainan, Taiwan, and General Chair of the 102nd annual meeting of OSA (FiO/LS 2018) held in Washington, D.C.. Dr. Lee has been a reviewer for 78 different journals. His current research interests focus on LC photonic and dielectric properties, photonic crystals, plasmonics, and LC-based biosensing.