

Nanophotonics for Application in Biosensing

Yia-Chung Chang

Research Center for Applied Sciences, Academia Sinica

Abstract:

The development of functionalized nanostructures has recently attracted a great deal of research interests. Among a variety of nanostructures, a myriad of studies related to noble metal nanoparticles have been conducted in hope of utilizing their strong interaction with light for physical, chemical, and biological applications. Here the speaker discusses the use of spectroscopic ellipsometry (SE) measurements combined with efficient theoretical modeling to reveal the size, shape, and distribution of randomly-distributed gold nanoparticles on a glass substrate. These obtained distribution properties are in good agreement with scanning electron microscopy (SEM) measurements. The speaker and his research group have also studied the ellipsometric response of various protein molecules attached to gold nanoparticles (AuNPs) on a substrate. They monitor the induced changes in polarization state or phase of reflected light from the surface which depend on surface properties of the sample and they use these changes versus the photon energy as a sensor signal to detect the interaction of biomolecules with the prepared surface.

References:

1. Optical metrology of randomly-distributed Au colloids on a multilayer film, S.-H. Hsu, Y.-C. Chang*, Y.-C. Chen, P.-K. Wei, Y. D. Kim, *Optics Exp.* **18**, 1310-15 (2010).
2. Surface plasmon resonance ellipsometry based sensor for studying biomolecular interaction, R. S. Moirangthem, Y. C. Chang*, S. H. Hsu, P. K. Wei, *Biosensors and Bioelectronics* **25**, 2633-38 (2010).
3. Ellipsometry study on gold-nanoparticle-coated gold thin film for biosensing application, R. S. Moirangthema, Y.-C. Chang*, P.-K. Wei, *Bio. Opt. Exp.* **2**, 2569 (2011)
4. Enhanced localized plasmonic detections using partially-embedded gold nanoparticles and ellipsometric measurements, R. S. Moirangthem, M. T. Yaseen, P.-K. Wei, J. Y. Cheng, and Y. C. Chang*, *Bio Opt. Exp.* **3**, 899 (2012).

About the speaker:

Yia-Chung Chang received his PhD degree from California Institute of Technology in 1980. He joined the Physics Department, University of Illinois at Urbana-Champaign in 1980 as a visiting research assistant professor, and became an assistant professor in 1982, associate professor in 1986, and professor in 1991. In 2005, he joined Academia Sinica, Taiwan as a Distinguished Research Fellow and Director of the Research Center for Applied Sciences (RCAS). In 2012, he completed his two terms of directorship and remained as a Distinguished Research Fellow in RCAS. His main research interests include condensed matter theory, semiconductor electronics, photonic materials, and optoelectronic devices. He is a fellow of American Physical Society and a fellow of Academy of Nanoscience and Nanotechnology. He received the Distinguished Alumni Award of National Cheng-Kung University in 2009. He is a Thomson ISI highly cited scientist. He has published over 320 papers in SCI journals with ~8000 citations.