26th International Conference on
Nanotechnology and Nanomedicine
May 13, 2022 | Webinar

Received date: 24-11-2021 | Accepted date: 27-11-2021 | Published date: 25-05-2022

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Orthogonal aubmicropolarizer array biochip for super-resolution imaging

Advances in miniaturization technology enable all-in-one optics integration on a chip or a sensing device replacing various functions of an optical microscope system. For example, a grating waveguide integrated on a chip can generate similar evanescence wave excitation for single-molecule detection like conventional total internal reflection fluorescence microscopy (TIRFM). In addition, super-resolution microscopy could be also achieved by creating a chessboard pattern illumination using an orthogonal sub-micro polarizer array embedded under a nanowell array accompany by a switchable polarized excitation light to overcome the diffraction barrier and achieve a theoretical √2- or √3-fold resolution improvement via two imaging capture rather than conventional structure illumination microscopy (SIM) via multiple imaging and complex deconvolution process. This optics integrated biochip could be used for practical nanoarray analysis, such as next-generation sequencing (NGS), to either enlarge the field of view to accelerate the scanning speed of a whole chip or increase the reaction density for multiple throughputs.

Recent Publications

1. Hsin-Yi Hsieh, Chung-Hao Lin, Wei-Ko Wang, and Chin-Chuan Hsieh. Nanowell-Based Orthogonal Submicropolarizer Array Biochip for Multiple Throughput of Fluorescence Sequencing. ACS Appl. Nano Mater. 2021; 4(10): 10409-10718

2. Hsin-Yi Hsieh, Tsu-Wei Huang, Shih-Yi Liu, Yun-Ju Chuang, Chun-Ying Tsai, Wei-Jung Wu, Cheng-Ting Tsai, Utkur Mirsaidov, Paul Matsudaira, Chia-Shen Chang, Fan-Gang Tseng, Fu-Rong Chen et al. Dynamics of hydrogen nanobubbles in KLH protein solution studied with in situ wet-TEM. Soft Matter. 2013; 9(37): 8856-8861

3. Hsin-Yi Hsieh, Jian-Long Xiao, Chau-Hwang Lee, Tsu-Wei Huang, Chung-Shi Yang, Pen-Cheng Wang, Fan-Gang Tseng, et al. Au-coated polystyrene nanoparticles with high-aspect-ratio nanocorrugations via surface-carboxylation-shielded anisotropic etching for significant SERS signal enhancement. The Journal of Physical Chemistry C. 2011; 115(33): 16258-16267.

Speaker Biography

Hsin-Yi Hsieh has completed her Ph.D. from the Institute of Nanoengineering and microsystems, National Tsing Hua University, Taiwan. She has been training with BioMEMS, including microfluidics, microarrays, cell/tissue engineering and single-molecule detection/spectroscopy in her master's and Ph.D. education. Before VisEra, she has a year visiting scholar at Harvard Medical School, a year PostDoc at National Taiwan University and 5 years of project management experience in Personal Genomics Inc. (Taiwan) for the development of CMOS-based single-molecule DNA sequencing. Now, she is an R&D Project Manager of VisEra Technologies Company Ltd., Taiwan for the wafer-level optics development and function verifications, especially nanophotonics integration for bio-applications. She has 7 journal papers in the first or corresponding author, i.e. ACS Nano, ACS Applied Nano Materials, Lab on a Chip, Journal of Material Chemistry and Analytical Chemistry and more than 15 US invention patents granted or application.

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