Hybrid microfluidic Lab-on-a-Chip and nanotechnologies for low-cost disease diagnosis

XiuJun (James) Li, Ph.D.
[1:]Department of Chemistry, [2]: Border Biomedical Research Center (BBRC), [3]: Biomedical Engineering (BME), [4]:Material Science & Engineering (MASE), [5]: Environmental Science & Engineering (ESE), University of Texas at El Paso, Texas, 79968

Infectious diseases and cancer are major "Killers" worldwide. The demands for rapid, accurate and low-cost early diagnosis of these diseases are challenging conventional diagnostic methods, especially in low-resource settings. Recently, fast growing microfluidic lab-on-a-chip and nanotechnologies have caused significant impact on modern disease diagnostics. Herein, I will highlight several paper/polymer hybrid microfluidic devices and nano-biosensing techniques that we recently developed for rapid disease diagnosis, especially for resource-poor settings. Difference chip substrates have different advantages as well as limitations. Paper/polymer hybrid microfluidic devices can draw more benefits from both substrates. Integrated graphene oxide nano-biosensors, on-chip DNA amplification and immunoassay, and nanoparticle-mediated photothermal immunosensing will also be discussed toward their applications in point-of-care infectious disease diagnosis and cancer biomarker detection.

Biography

XiuJun (James) Li, Ph.D., is a tenure-track Assistant Professor in the Department of Chemistry, Border Biomedical Research Center, Biomedical Engineering, and Materials Science & Engineering at University of Texas at El Paso (UTEP). After he obtained his Ph.D. degree in microfluidic single-cell analysis with Prof. Paul Li from Simon Fraser University (SFU) in Canada in 2008, he pursued his postdoctoral research in integrated microfluidic devices for genetic analysis with Prof. Richard Mathies at UC Berkeley, and low-cost diagnosis with Prof. George Whitesides at Harvard University, while holding an Postdoctoral Fellowship from Natural Sciences and Engineering Research Council (NSERC) of Canada. He has gained extensive experiences in bioanalysis using microfluidic systems, such as single-cell analysis, genetic analysis, low-cost diagnosis, pathogen detection, 3D cell culture, and so on. Dr. Li's current research interest is centered on the development of innovative microfluidic technologies and nanotechnologies for bioanalysis, environmental analysis and bioengineering. He has authored/coauthored about 45 publications, guest edited a thematic issue "Miniaturized platforms and methods for pharmaceutical studies" in *Current Pharmaceutical Biotechnology*. He published a book of "Microfluidic Devices for Biomedical Applications" from Elsevier in 2013. He has been invited to serve in multiple grant review panels including NSF, NASA and CHIR *et al*, and multiple journal editorial boards. He is an editor of *Scientific Reports* from the Nature publishing group. His research has been funded by National Institute of Health (NIH), UT System, UTEP, State Key Laboratory of Bioreactor Engineering of China and other agencies. During the last 4.5 years, he received about $1.5M research funding from NIH and other funding agencies. He is the recipient of UT STARS award in 2012, Outstanding Performance Award from UTEP in 2013 and 2015, and an international award of "2014 Bioanalysis Young Investigator Award".