

Nanoplasmonic Material based Optofluidic Biosensors for Label-Free Immune Functional Analysis towards Personalized Immune Therapy

Wen Yang, Jiacheng He, Yuxin Cai, Alana MacLachlan, Chuanyu Wang and Pengyu Chen*

Materials Engineering, Department of Mechanical Engineering
Auburn University
Auburn, AL, USA
pengyuc@auburn.edu

The study of immune functional responses is essential to understand the central role of the immune system in providing immunological host defense and its intercommunication with other systems. Cytokines are one of the key biomolecules acting as intercellular mediators and modulators to regulate the diverse functions in the immune response. Rapid and accurate quantification of cytokine-based immune fingerprints plays a decisive role in effectively treating immune-related diseases especially at point-of-care, where an immediate decision on treatment is needed upon precise determination of individual patient's immune status. Derived from the emerging clinical demands, there is an urgent need for cytokine immunoassays that offers unprecedented sensor performance with high sensitivity, throughput, and multiplexing capability, as well as short turnaround time at low system complexity. In this talk, we will present a number of novel plasmonic nanomaterial based optofluidic cytokine biosensors for label-free immune functional analysis from whole blood to single-cell level. The multi-scale research both experimentally and theoretically will bridge the gap in fundamental understanding of immune system and enhance the applicability, diagnosis and prediction power for immune diseases. The developed platforms would ultimately gear the biologists and clinicians with capability to real-time monitor the immune status of patients, a transformative achievement that has immense potential towards safe, effective and personalized immune therapy.

