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Optofluidics-based nanosensing platform for sensitive and selective detection of trace environmental pollutants

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Abstract

A simple optofludics-based nanosensing system for sensitive and selective of trace environmental pollutants was successfully achieved by the effective integration of microfluidic platform with a QD-FRET-based bioassay. Nanoprobes were synthesized by conjugating carboxyl quantum dots with bisphenol A-BSA (BPA-BSA). Based on the indirect competitive immunoassay mode, the biosensing assay of BPA using the optofluidics-based nanosensing system in water samples featured good characteristics with its high sensitivity, rapidity, small sample volume, and minimum sample manipulation. BPA was quantified over the concentration range of 0.92 nM to 10.5 nM with a detection limit of 0.43 nM. Compared with traditional techniques, this system provides several advantages. First, by using assembled functional haptens that are conjugated to QD surfaces as recognition elements, the QD-hapten nanoprobe is more stable in complex environmental samples. Moreover, the binding properties of immobilized biomolecules are not compromised when the probes are prepared by immobilizing haptens onto the QD surface. Second, the structure of QD-protein-haptens prevents steric hindrance and maintains the high activity of the QD nanoprobe for its specific. Third, the FRET efficiency is higher because of the increased number of acceptor dyes bound to one QD surface, which results in the high sensitivity of the QD-FRET assay. Finally, an important feature of this optofluidic biosensing system is that only a small amount of sample solution (<10 μL) is required for analyses.

Biography

Feng Long is associate professor at Renmin University of China. He received his PhD from Tsinghua University in 2008 and completed postdoctoral studies from Department of Chemistry, Massachusetts Institute of Technology. He has extensive experience in conducting frontier research and developing tangible technologies such as nanostructure biosensors and evanescent wave optical biosensors. He also demonstrated excellence of track record in technology development, publication, patenting and technology transfer. He has published more than 35 papers in reputed journals and has been serving as an editorial board member of reputed journals.