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Facile preparation of multi-scaled quantum dot barcodes and their application in multiplexed hepatitis B detection

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Abstract

The development of both disease diagnosis and therapeutic treatment requires real-time information from multiple targets, such as genes and proteins, to establish a universal identification of biological entities. Multiplexed biochips, which facilitate parallel target recognition, provide the most promising way to achieve this goal. Among various multiplexed biochips, multiplexed suspension assays of QD (Quantum Dot)-encoded microspheres are highly advantageous. This arises from the excellent fluorescent properties of the QDs incorporated into these microspheres, thus allowing them to serve as "QD barcodes". QD barcodes can be prepared through various approaches. However, the formulation of improved synthetic techniques that may allow more efficient preparation of QD barcodes with better encoding accuracy still remains a challenge. In this report, we describe a combined Membrane Emulsification-Solvent Evaporation (MESE) approach for the efficient preparation of QD barcodes. By combining the advantages of the MESE approach in controlling the barcode sizes with accurate encoding, a three dimensional barcode library that integrates the signals of the FS (Forward Scattering), FL2 (Fluorescence 2), and FL3 (Fluorescence 3) Channels was established via flow cytometry. The five indexes of hepatitis B viruses (HBV) were chosen as diagnostic targets to examine the feasibility of the QD barcodes in high throughput diagnosis. On the basis of showing that singleplex detection is feasible, we demonstrate the ability of these QD barcodes to simultaneously and selectively detect a multitude of diverse biomolecular targets.

Biography

Hongjing Dou has completed his Ph.D at the age of 26 years from Fudan University of China and postdoctoral studies from Queen's University of Canada. She is currently an associate professor of School of Materials Science & Engineering, Shanghai Jiao Tong University, China. She has published more than 35 papers in reputed journals and delivered 10 presentations in material related international conferences.