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INDICATOR DISPLACEMENT BASED QUANTUM DOTS LIGAND PROBES FOR BIOMARKER DETECTIONS

Haojun Jin
Southeast University, China

Indicator displacement assay (IDA) have attracted tremendous interest recently because of their advantages of improved selectivity, high sensitivity and visibility for detection of diverse analytes such as anions, amino acids, saccharides and other functional group molecules. With a configuration of indicator-receptor, the analyte is detectable upon its competitive binding with receptor, thus giving rise to a new signal for the released indicator. Quantum dots (QDs) are a class of inorganic fluorophores with high fluorescence quantum yields, size-tunable narrow emission, and exceptional resistance to photo bleaching. Therefore, the QDs are one of the best candidates to serve as indicators in IDAs. In this work, we report quantum dots-ligand fluorescent probes for sensitive and selective detection of biomarkers, including G-quadruplex and avidin, based on IDA. In the IDA approaches, red-emission quantum dots (rQDs) deposited on silica coated green-emission quantum dots (gQDs) are indicators, while ligands (DI for G-quadruplex and PB for avidin) are receptors. The non-aqueous soluble receptors are facilely attached onto the surface of rQDs via phase transfer, and inducing the fluorescence quenching of rQDs in the mechanism of charge transfer (CT). As a key element in the IDAs, displacement of the receptors (ligands) can take place in the presence of trace concentrations of biomarkers due to their stronger affinity, breaking up the QDs-ligand complexation. Consequently, the CT processes are eliminated and the fluorescence of rQDs is restored. However, the fluorescence of gQDs stays constant due to the protection of silica in both of the IDAs. By measuring the fluorescent intensities of gQDs and rQDs, the ratiometric fluorescent response, which is extremely useful for improving the sensitivity and reliability, is achieved. Moreover, variations of dual-emission intensity ratios in the IDAs result in the continuous solution color changes, with benefits of which, naked-eye quantifications of the biomarkers are realized.

Biography

Haojun Jin completed his Bachelor degree in Applied Chemistry in 2008 from Nanjing Agricultural University. He completed his Master degree in Organic Chemistry in 2011 from Nanjing Tech University. In 2013, he started his Doctoral program in State Key Laboratory of Bioelectronics, School of Biological Science & Medical Engineering, Southeast University, supervised by Professor Qingjiang Sun. As planned, he will complete Doctoral degree in 2018. His dissertation mainly focuses on design and construction of indicator displacement assay based quantum dots-ligand probes, which are applicable for biomarkers. Until now, he has authored three papers in the esteemed international journals.

bbcc.zhangshuyan@163.com