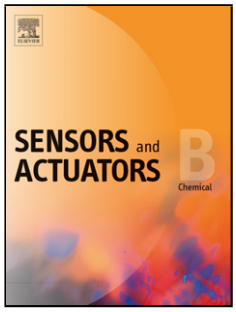

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Measuring Ultra-low Levels of Nucleotide Biomarkers Using Quartz Crystal Microbalance and SPR Microarray Imaging Methods: A Comparative Analysis

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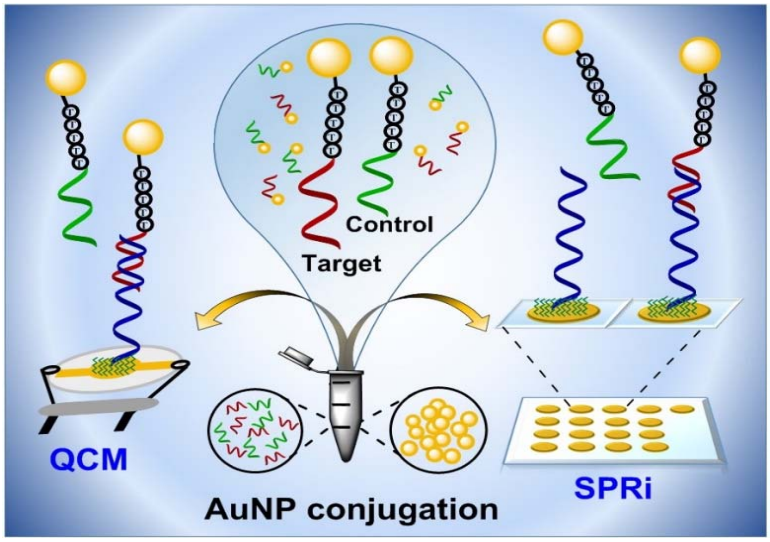
Research Highlights

- Ultra-sensitive miRNA-21 mimic nucleotide mass sensor/imaging arrays
- Comparative analysis of QCM and SPR microarray imager
- High selectivity and good sample recovery demonstrated
- Gold nanoparticles based signal amplification upon hybridization
- Microarray method development for sample analysis in complex matrices

Graphical abstract



Abstract

Circulating serum nucleotide biomarkers are useful indicators for early diagnosis of cancer, respiratory illnesses, and other deadly diseases. In this work, we compared detection performances of a quartz crystal microbalance (QCM), which is a mass sensor, with that of a surface plasmon resonance (SPR) microarray for an oligonucleotide mimic of a microRNA-21 biomarker. A surface immobilized capture oligonucleotide probe was used to hybridize with the target oligonucleotide (i.e., the microRNA-21 mimic) to facilitate selective detection. To obtain ultra-low femtomolar (fM) detection sensitivity, gold nanoparticles (50 nm) were conjugated