A Novel Approach to the Engineering of a Gold Nanorod Based Multiplex Biosensor

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The unique properties of gold nanorod's (GNR's) biosensing capability were applied to produce a multiplex, cost and time-effective, biodiagnostic assay for the early detection of multiple diseases simultaneously. Gold nanorods were chosen as the biodiagnostic medium because of their unique ability to be tuned via the quantum confinement effect. Specifically, several antibodies were thiolated and conjugated to the GNRs (990 nm and 900 nm in size), immobilized onto thiol-terminated 96-well plates, and treated to prevent non-specific binding. As a model system, various combinations of concentrations of biomarker antigens (Human IgG, Rabbit IgG, and HER2) were tested by the biodiagnostic assay and measured by correlating redshifts at distinct resonance peak regions caused by specific antigen binding. Calibration curves exhibited a direct linear relationship between spectral shifts (redshifts) and analyte concentration. The sensing performance of the multiplex assay was demonstrated by thorough statistical analysis to be more efficient than the basic GNR biodiagnostic model. This research used a data processing algorithm to efficiently analyze more than 6,000 trials, while at the same time minimizing human error and the possibility of misdiagnosis. This novel GNR based approach to multiplex biodiagnostics is 20x less expensive and 18x faster than current colorimetric blood assays, and has a 0.01% misdiagnosis rate. Based on these promising results it can be concluded that the utilization of this novel multiplex biodiagnostic assay can open the door for a new paradigm of development in the era of efficient nanobiosensing.

Awards Won:

Third Award of $1,000