

Enhancement of Sensitivity Using Hybrid Stimulus for the Diagnosis of Prostate Cancer Based on Polydiacetylene (PDA) Supramolecules

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A microchip based on polydiacetylene (PDA) was developed to detect prostate specific antigen- α 1-antichymotrypsin (PSA-ACT complex) in PBS buffer. To fabricate the PDA chip, polydiacetylene vesicles are immobilized on amine glass and conjugated using the NHS/EDC chemical reaction. Herein, an ethylenediamine as interlinker is then added to crosslink the PDA vesicles, followed by UV irradiation to polymerize the NHS-ester group-functionalized polydiacetylene vesicles. Using the prepared PDA chips, the PSA-ACT complex in PBS buffer was detected at 10 ng/mL by a primary immunoresponse. However, this detection sensitivity was not enough for the diagnosis of prostate cancer because the concentration of PSA in normal human is smaller than 4.0 ng/mL. To solve this problem, the polyclonal PSA antibody-conjugated magnetic beads were used as an amplifying agent in this study. As a result, the PSA-ACT complex concentrations (as low as 0.1 ng/mL) could be detected in the PBS buffer sample. Therefore, this result can be applied to various fields, such as the detection of cells, proteins, and DNA etc., for sensitive and specific biosensing based on PDA supramolecules.