Chemical and biological detection using ZnO nanowire based biosensor

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ZnO nanowires have superior properties such as a large piezoelectronic constant, wide band gap energy, large exciton binding energy, and high chemical reactivity. To address this issue, novel core-shell nanowires were investigated in this work, which they exhibited not only the improved pristine properties, but also novel functional properties. The fabricated ZnO/a-C core-shell nanowires showed high chemical stability, good electrical transport, and fast UV response and recovery. The biomolecules immobilization and NH_3 plasma treatment was demonstrated for the first time this work. It is concluded that this biomoelecules immobilization scheme from this approach is very robust and highly reproducible method through various experimental evaluations. Then, the ZnO/a-C core-shell nanowire sensors immobilized with biotin molecules were demonstrated for the detection of streptavidin and avidin. For the liver carcinoma detection, the AFP monoclonal antibody immobilized ZnO/a-C core-shell nanowire sensors were shown to be capable of highly selective and sensitive detection of AFP antigen.