Nanoscale ZnO biosensor using novel functionalization platform for chemical and biological applications

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ZnO nanowires are regarded as one of the promising candidates for high performance biosensor applications due to their unique properties. Nanowires have very high surface-to-volume rates. To achieve this goal, robust bio-molecule immobilization on ZnO nanowires surface with high solution stabilities still remain a great challenge for chemical and biological sensor applications. In this work, we present systematic comparative studies of functionalization methods including covalent bonding with the silane based modifier and surface polymerization with plasma. ZnO nanowire devices with the optimized functionalization methods were successfully demonstrated for the pH sensing. In addition, we have proposed the detection mechanisms of various bio-molecules such as streptavidin/avidin, and Hepatocellular Carcinoma (HCC) markers. To verify our approaches, the bio-molecule immobilized surfaces of ZnO nanowires were investigated using fluorescence microscopy and field effect transistor (FET) with electrolyte gate configuration.