

ZnO nanowire devices based on 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. In this work, we present systematic comparison studies of several functionalization methods using the silane based modifier and surface polymerization with plasma. Furthermore, it was found that the long time stabilities of the optimized ZnO nanowire devices under acidic or basic solution can be drastically improved as compared to the pristine ZnO nanowires. The ZnO nanowire devices with the optimized functionalization methods were successfully demonstrated for the pH sensing, and the label free detection 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 with electrolyte gate configuration. Our results can be easily extended to real time label-free detections of specific biomolecules for the diagnostic of various disease.