Comparison study on non-covalent and covalent immobilization effects in ZnO nanowire based biosensor

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ZnO nanowire is one of the best semiconducting materials in term of its superior properties, such as wide band gap energy (3.37 eV), large exciton binding energy (60 meV), high thermal and mechanical stability. Therefore, it is suitable for the fabrication of variety of devices which includes transparent transistors, and biological sensing. Although ZnO nanowires are one of the promising candidates in biosensor applications, robust surface functionalization technology still remain a great challenge for biological sensor applications. In this work, we have fabricated NH3 plasma treated (non-covalent) and APTES modified (covalent) a-C/ZnO core-shell nanowire FETs as novel biosensor platform for the detection of liver cancer antigen. As increasing concentration of target antigen, sharp decrease in the source-drain current was observed in NH3 plasma treated a-C/ZnO core-shell nanowire FETs. In case of APTES modified a-C/ZnO core-shell nanowire FETs, the current through the nanowire was increases as the concentration increase. These result will be explained in terms of non-covalent binding and covalent binding in a-C/ZnO core-shell nanowire.