Real-Time and Label-Free Detection of Hepatocellular Carcinoma Markers using Bio-functionalized ZnO/a-C Core-Shell Nanowires

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Nanotechnology combined with biotechnology is expected to provide novel paradigm breaking solutions in the area of sensing. Due to the high surface-to-volume ratio of the 1D nanostructure, it has been reported that the detection sensitivity of 1D field effect transistor (FET) biosensors may be increased up to a single-molecular detection level. In this work, we demonstrated real-time and label-free detection of hepatocellular carcinoma markers using effective nanosensor platform. For this work, we introduce two different functionalization schemes to immobilize alpha-feto protein (AFP) antibodies onto the ZnO/a-C (amorphous carbon) core-shell nanowires (NWs) field-effect transistors (FETs) surface for optimizing detection performance: (1) non-covalent binding and (2) covalent binding to the ZnO/a-C core-shell NWs surface. The bio-sensing performance for different type of immobilization methods will be discussed with their sensing mechanisms.