CHEMIRESISTIVE AND RESISTIVE SWITCHING SEMICONDUCTOR BASED SENSOR FOR BIOMOLECULE DETECTION

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Recently, chemiresistive semiconductor, which varies its resistance or conductance status based on chemical phenomena at its surface, has been developed as a sensor device for biomolecule detection. Particularly, graphene has been one of the best example for the chemiresistive semiconductors, even for resistive switching semiconductors. In addition, the graphene is two-dimensional (2D) carbon structure having a large surface area, where significant biosensing applications have been continuously reported. In this study, we demonstrated reduced graphene oxide (rGO) biosensor structure for a stress hormone, i.e. cortisol, sensing. The device structure was stepwise self-assembly monolayers (SAMs) stacked by reduced graphene oxide between source and drain. Then, cortisol monoclonal antibody (c-Mab) was chemically tethered on reduced graphene oxide layer for the cortisol detection by its specific antigen-antibody binding. The current versus voltage (I-V) curve exhibited resistance changes and resistive switching I-V behaviors as a sensing mechanism, which demonstrated a unique possibility of rGO semiconductor based sensor. Also, chemiresistance change in the forms of resistance ratio was calibrated in terms of sensing cortisol concentration as shown in Figure 1.

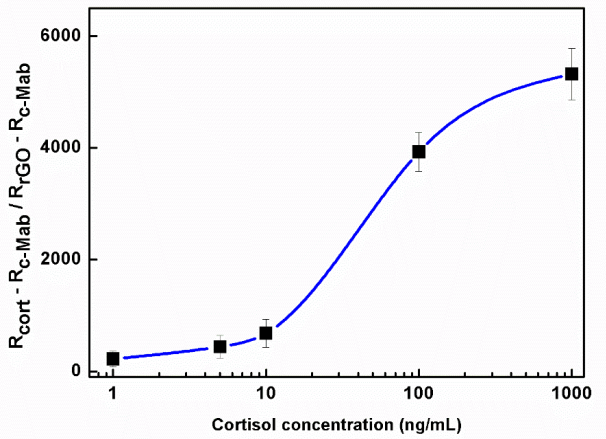

Figure 1 – Chemiresistance calibration plot of various concentration of cortisol solution on the 53 nm thick sensor