A Chlorine-Trapping in CVD Bilayer Graphene for Resistive Pressure Sensing with High Detection Limit and High Sensitivity

Viet Phuong Pham,1 Minh Triet Nguyen,2 Sang-Woo Kim,1,2 Nae-Eung Lee,1,2 Geun Young Yeom1,2*

1 SKKU Advanced Institute of Nano Technology (SAINT), Sungkyunkwan University (SKKU), Suwon, 440-746, Republic of Korea.

2 School of Advanced Materials Science and Engineering, Sungkyunkwan University (SKKU), Suwon, 440-746, Republic of Korea.

*E-Mail: pvphuong1985@gmail.com or gyyeom@skku.edu

Pressure sensing is one of the key function of smart electronics. The fabrication of pressure sensors that may imitate and overcome the sophisticated pressure sensing characteristics in nature and industry needs more much efforts, especially, in the innovation from new materials as well as structures. Almost reported pressure sensors have a high sensitivity at low pressure detection limit (<10 kPa). However, the exploration of sensitivity and responsivity at high pressure detection is still inadequate understanding and challenging. Here, we report an exotic heterostructure structure based on ZnO/low energy chlorine radical-trapped bilayer graphene (ZGClG) as an ideal channel in pressure sensors with highly sensitivity (0.19 kPa-1), responsivity (0.575 sec) on glass substrate under a widespread (0~98 kPa) were achieved at Vds= 1V. In addition, the detection limit of pressurizing force for this device is as superior as 98 kPa. The sensing mechanism under pressurizing shown that the significantly effect of p-type heavy doping of low energy radical chlorine (Cl) in pressure-sensing at 300K. This work indicates that ZGClG pressure sensing device could be greatly promised to provide a simple route to an essential sensing platform for chemical-, medical-, and biological-sensing in future smart electronics.