Ketamine detector using conductivity change of antibody-immobilized graphene layer

Ji-hun Sim[1]
Woo-jong Yu[1]*
[1]*Department of Electrical and Computer Engineering, Sungkyunkwan University, 2066, Seobu-ro, Jangan-gu, Suwon-si 16419, South Korea*
vmv45@naver.com

Recently, sensor development is aimed at miniaturization and low power consumption. However, existing sensors have a limit in miniaturization and a limit in sensing sensitivity due to a reduction in area. Because two-dimensional materials are atomically thin, high-sensitivity sensing is possible despite miniaturization, and graphene has unique electrical properties.
Graphene has a unique bandgap structure like a semi-metal and has very high conductivity. These properties have proven that graphene has a very high surface conductivity and is useful in various sensing platforms [1]. We used these characteristics to create a highly sensitive sensor that detects ketamine among drug species. When a solution is dropped on the surface of graphene on which the ketamine antibody is immobilized, only ketamine is bound to the antibody, and at this time, the conductivity of the graphene surface changes, resulting in a change in the amount of current. By measuring the graphene current, it is possible to check whether the target material is adsorbed. The manufactured sensor showed a very high sensitivity capable of measuring concentrations ranging from 10^{-7}M to 10^{-4}M, which suggests a high possibility for sensing other micromaterials besides ketamine.

References

[1] S. Wang, M. Z. Hossain, K. Shinozuka, N. Shimizu, S. Kitada, T. Suzuki, R. Ichige, A. Kuwana and H. Kobayashi, 'Graphene field-effect transistor biosensor for detection of biotin with ultrahigh sensitivity and specificity', Biosensors & Bioelectronics, 2020

Figures

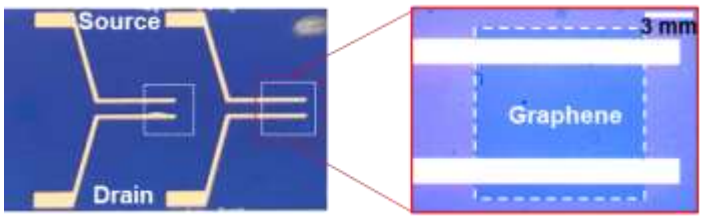

Figure 1: OM image of Drug sensor using graphene sensing layer

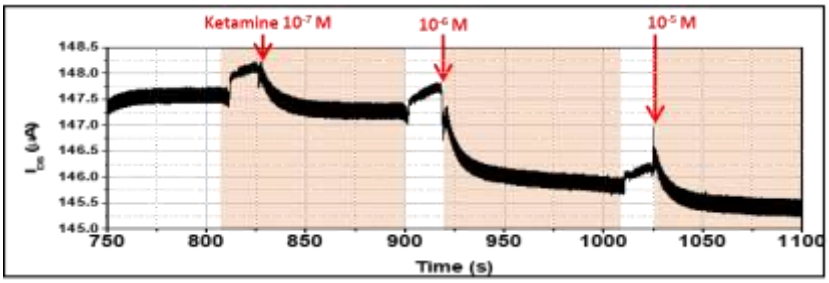

Figure 2: Measurement results of ketamine concentrations from 10^{-7}M to 10^{-4}M