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Temperature dependence of graphene and N-doped graphene for gas sensor applications

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Micrometre-scale graphene sensors can detect individual molecule adsorptions or desorptions [1]. This is due to its low-noise electronic characteristics. However, molecules in gas phase rarely adsorb on non-defect graphene surfaces. By doping graphene with nitrogen, the atomic structure and electronic properties of graphene were modified. Here, we measured the sensitivity of graphene and N-doped graphene to ethanol vapor as gas sensors with varying concentration of ethanol and temperature of graphene. Graphene was synthesized by chemical vapor deposition on copper foils, and then transferred onto glass slide by chemical etching. N-doped graphene was produced by annealing graphene in ammonia atmosphere. Our results showed the sensitivity of both graphene and N-doped graphene are low, ~ 1 . No significant dependence of sensitivity on concentration of ethanol gas in the range of 25-200 ppm was observed. Sensitivity of graphene increases with temperature from 25 °C to 150 °C up to 1.2%, but that of N-doped graphene decreases by 2%.

Reference

[1] Schedin, F., Geim, A. K., Morozov, S. V., Hill, E. W., Blake, P., Katsnelson, M. I. and Novoselov, K. S. Detection of individual gas molecules adsorbed on graphene. *Nature Nanotech.* **6**, 652-655 (2007).

Author: PANYATHIP, Rangsan (Department of Physics and Materials Science, Faculty of Science, Chiang Mai University)

Co-authors: Dr SINGJAI, Pisith; CHOOPUN, Supab; SAKULSERMSUK, Sumet (Chiang Mai University)

Presenter: PANYATHIP, Rangsan (Department of Physics and Materials Science, Faculty of Science, Chiang Mai University)

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