

Electronic properties of few layer graphene on SiC under UV illumination

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Although graphene is considered as one of the most stable 2D crystals [1], it shows important sensitivity to gas atmosphere [2] leading to sensor applications, when gas atoms are adsorbed to the surface [3]. However, as shown by our previous studies [4], it is not only the surface that is affected by the changing atmosphere: X-ray reflectometry spectra revealed some intercalation-like processes in between the graphene sheets. Interestingly, the changes introduced by sample exposition to ambient atmosphere, were easily reset by sample illumination with UV light.

The motivation of this work was to make complementary studies, where electrical properties of graphene are monitored while the sample, kept at ambient conditions, was exposed to UV light from Hg bulb. Samples were grown by CVD on SiC (0001), both 4H and 6H polytypes, with and without hydrogenation process, leading to both p and n-type samples. The resistance of graphene was measured by four probe method and the temperature and humidity in the vicinity of samples were registered.

We have observed two kinds of phenomena after exposure to UV light, with a different time scales:

- 1) a slow one: a significant rise of sample resistance reaching a saturation after tens of minutes, for n-type samples. Effect for p-type samples is vastly less pronounced;
- 2) a quick one, in a second scale: light-induced increase or decrease of resistance, specific to substrate/graphene type (see Figure 1).

We will propose a plausible scenario explaining the observations, taking into account both the properties of graphene and a possible impact of UV light on SiC.

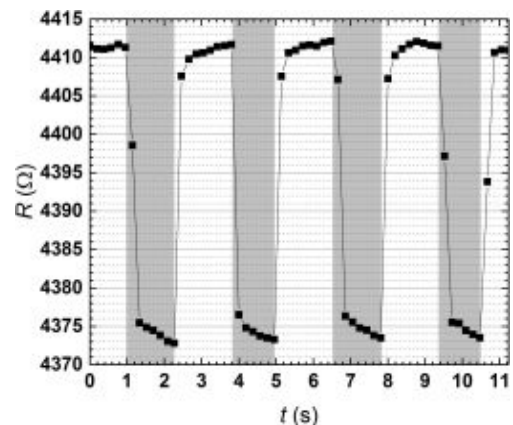


Figure 1. A sample resistance modified by UV light. Grey areas correspond to the 'dark' time

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[3] S. Wu, Q. He, C. Tan, Y. Wang, H. Zhang, Small, 9, 1160 (2013)

[4] M. Tokarczyk, G. Kowalski, M. Gryglas-Borysiewicz, P. Ciepielewski, M. Możdzonek, W. Strupiński, J.M. Baranowski, "Structural investigation of graphene layers grown on 4H-SiC - buffer layer engineering", poster at "45th „Jaszowiec” International School and Conference on the Physics of Semiconductors", Szczyrk, 2016