Toetab TÜ ja TTÜ doktorikool “Funktsionaalsed materjalid ja tehnoloogiad”(FMTDK)

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USING LARGE-AREA GRAPHENE PREPARED BY CHEMICAL VAPOR DEPOSITION FOR GAS SENSORICS

Jekaterina Kozlova[a], Tauno Kahro[a], Jaan Aarik[a], Lauri Aarik[a], Harry Alles[a], Alar Gerst[a], Raivo Jaaniso[a], Aarne Kasikov[a], Ahti Niilisk[a] and Väino Sammelselg[a, b]

[a]*Institute of Physics, University of Tartu, Riia 142, 51014 Tartu*
[b]*Institute of Physical Chemistry, University of Tartu, Ravila 14a, 50011 Tartu*
e-mail: jekaterina.kozlova@ut.ee

Graphene and graphene oxide have a great potential as a material for gas sensors. We have synthesized large-area single-layer graphene on Cu foils using chemical vapor deposition (CVD) method (see Fig. 1) and transferred it to the top of a Si/SiO_2 substrate with Ti/Au electrodes that were deposited by electron beam evaporation.

When exposing the sensor to synthetic air at room temperature we detected n-type behavior of graphene: a slight decrease of current of the resistivity sensor was occurred if compared to the current in nitrogen atmosphere. Interestingly, p-type behavior, the increase of the current, was observed when temperature was raised to 100ºC. The initial n-type behavior was restored after the temperature was lowered back to room temperature, see in Fig. 2.

It is known that graphene sticked to the Si/SiO_2 substrate shows commonly p-type conductivity when kept under ambient conditions [1]. Possible reasons for unintentional n-doping of our graphene will be discussed in the presentation in more detail.

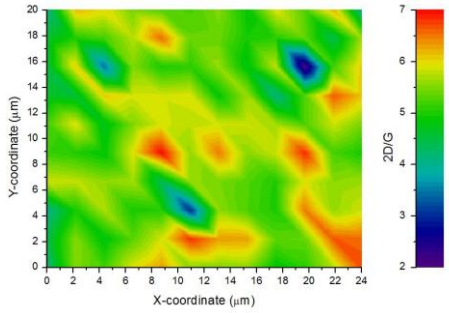

Fig. 1. The micro-Raman mapping image (20x24µm) from a large-area CVD graphene. The area ratio of two characteristic Raman peaks (2D-peak at ~2680 cm^{-1} and G-peak at ~1580 cm^{-1}) is presented and single-layer graphene is indicated with colours from green to red.

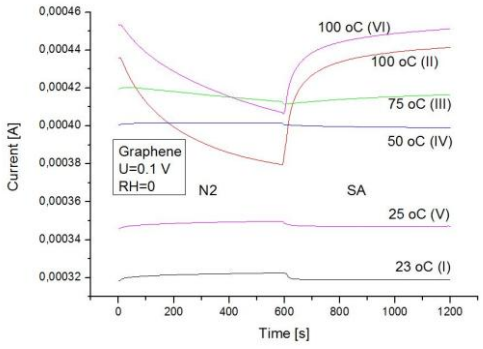

Fig. 2. The current change through the resistive gas sensor based on CVD graphene when exposing it to nitrogen (N_2) and synthetic air (SA) at different temperatures.

Reference

1. n-Type Behavior of Graphene Supported on Si/SiO_2 Substrates. Romero et al., ACS Nano, **2** (10) (2008), 2037–2044.