Focused ion beam assisted prototyping of graphene/ZnO devices on Zn-polar and Opolar faces of ZnO bulk crystals

R. Yatskiv
S. Tiagulskyi, H. Faitova, O. Cernohorsky, J. Vanis, J. Grym
Institute of Photonics and Electronics of the Czech Academy of Sciences, Chaberska 57, Prague 8, 18251, Czech Republic)
yatskiv@ufe.cz

We demonstrate an experimental approach for prototyping heterojunctions formed between graphene and bulk semiconductor substrates. This approach employs focused ion beam milling to fabricate microscale area heterojunctions and in-situ electrical measurements in the chamber of the scanning electron microscope to measure their electrical characteristics. The aim is to limit the impact of defects in graphene on the electrical characteristics of the junctions. The approach is demonstrated on graphene/ZnO structures with different polar faces. On these structures, theoretical predictions pointing to differences in charge transport are experimentally validated [1,2].

References

[1] W. Geng, X. Zhao, H. Liu, X. Yao, J. Phys. Chem. C, 117 (2013) 10536-10544.
[2] P.T. Xu, Q. Tang, Z. Zhou, Nanotechnology, 24 (2013) 305401.

Figures

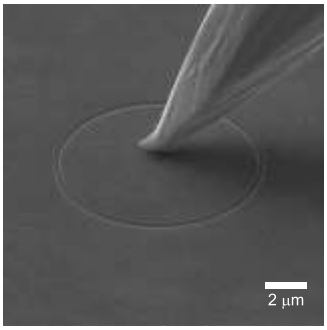

Figure 1: SEM image of the FIB-patterned graphene/ZnO structure contacted by the tungsten nanoprobe for the SEM in-situ electrical measurements.

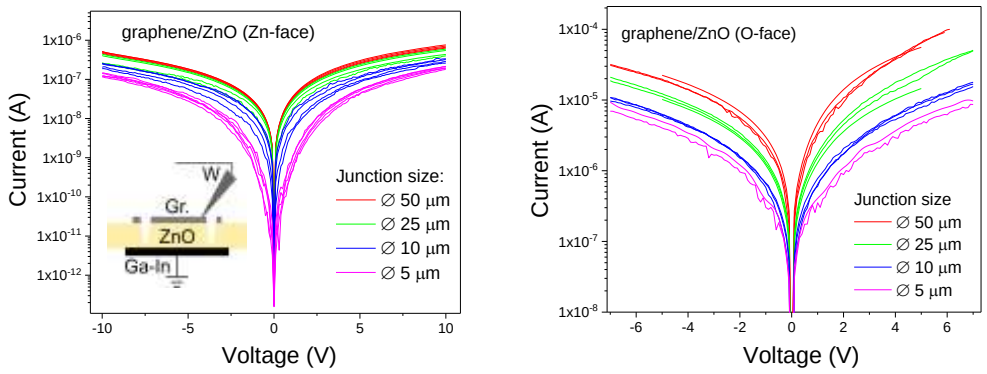

Figure 2: The the I-V characteristics of the graphene/ZnO structures with Zn-face polarity (left) and O-face polarity (right).