Carbon-enriched Epitaxial Boron Nitride Layers as Contact Material for h-BN Devices

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One of the most prominent members of the 2D materials, hexagonal boron nitride (h-BN), is the subject of extensive research thanks to their wide potential use in optoelectronics. However, the difficulty in producing high quality layers as well as the lack of ohmic contacts limits its practical use, despite excellent properties such as chemical stability, thermal conductivity and wide bandgap.

In this communication we study the effect of variable carbon content in h-BN layers, grown by Metaloorganic Vapor Phase Epitaxy (MOVPE)[1], on its optical and electrical properties in attempt to obtain a conductive contact material. Using nitrogen instead of hydrogen as carrier gas, as well as adjusting the ratio of gaseous precursors and temperature allows for the manipulation of carbon content in the grown layers.

The differences in sample compositions were estimated using EDX spectroscopy. Optical and electrical measurements were also performed. Raman and UV-Vis spectra confirm differences in both structure and bandgap.

Electrical measurements were performed on a Hall-bar structure, manufactured by plasma etching and photolithography processes. Results show a reduction in resistivity in samples with high carbon content in comparison to pure h-BN.

Optimizing the growth process in order to obtain high quality conductive layers is a promising step towards finding suitable contacts for future h-BN devices.

[1]A. K. Dąbrowska et al 2021 2D Mater. 8 015017

Acknowledgments: This work was partially supported by the National Science Centre of Poland, grants no 2019/33/B/ST5/02766, 2021/41/N/ST7/04326.