Temperature dependent transport measurements in high quality graphene/hBN heterostructures

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The pathway to both scalable growth and transfer methods for 2D materials is one of the key challenges to make the leap from laboratory to industry. Of particular importance is the material hexagonal boron nitride (hBN), which has proven to be an excellent insulating substrate and protective layer for graphene, 2D semiconductors, metals, magnets, and superconductors. To date, graphene/boron nitride structures allow for record charge carrier mobilities at room temperature, which is limited due to scattering of electrons with structural and electronic disorder potentials, acoustic/optical phonons, or remote interfacial phonons from the substrate [1,2]. Here we explore the influence of these different contributions to the transport performance at room temperature. For this purpose, temperature-dependent transport measurements between 1.6 and 300 K were performed in hBN/graphene/hBN Hall bars. We compare high quality devices built from different hBN sources and observe a large variation in their room temperature mobilities [3,4]. We identify fabrication-induced changes of the electronic properties of the patterned graphene as a possible source for this device-to-device variations.

References

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