Excellent Electronic Transport in Heterostructures of Graphene and Monoisotopic Boron-Nitride Grown at Atmospheric Pressure

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Hexagonal boron nitride (BN), one of the very few layered insulators, plays a crucial role in 2D materials research. In particular, BN grown with a high pressure technique [1] has proven to be an excellent substrate material for graphene and related 2D materials [2], but at the same time very hard to replace. Here we report on a method of growth at atmospheric pressure as a true alternative for producing BN for high quality graphene/BN heterostructures. The process is not only more scalable [3], but also allows to grow isotopically purified BN crystals [4]. We employ Raman spectroscopy, cathodoluminescence, and electronic transport measurements to show the high-quality of such monoisotopic BN and its potential for graphene-based heterostructures. The excellent electronic performance of our heterostructures is demonstrated by well-developed fractional quantum Hall states, ballistic transport over distances around 10 µm at low temperatures and electron-phonon scattering limited transport at room temperature [5].

References

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Figures

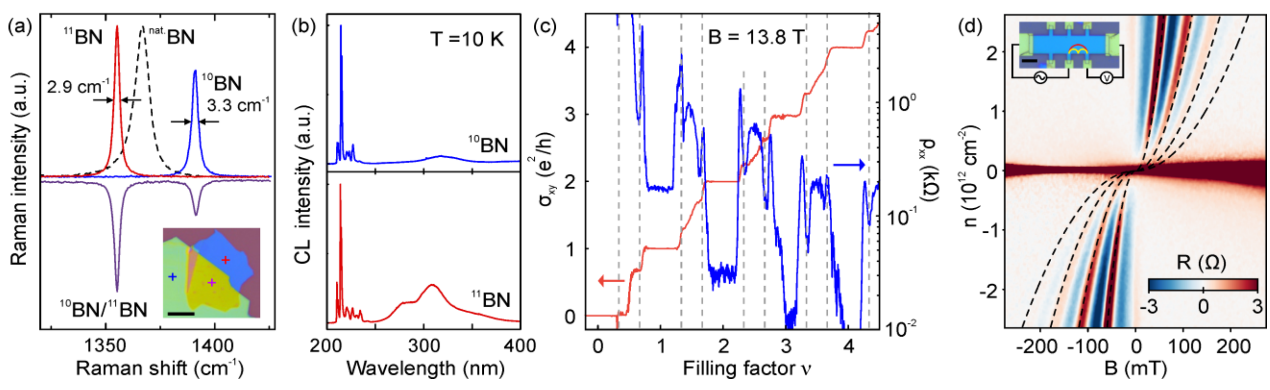

Figure 1: (a) Raman spectra of a heterostructure made from ^{10}BN and ^{11}BN. (b) Cathodo-luminescence spectra for both ^{10}BN and ^{11}BN crystals. (c) Quantized Hall voltage σ_{xz} (red) and longitudinal resistance ρ_{xx} (blue) as a function of filling factor. (d) Magnetic focusing of ballistic electrons shown via the non-local resistance as a function of B-field and charge carrier density.