

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

High-Bias Electronic Transport in Graphene Ribbon Devices

MELINDA HAN, INANC MERIC, KIN FAI MAK, STÉPHANE BERCIAUD, TONY HEINZ, KEN SHEPARD, PHILIP KIM, Columbia University — We present experimental studies of electronic transport in graphene under high electric fields. Graphene ribbon devices with varying widths and lengths are fabricated from mechanically exfoliated single-layer graphene sheets using electron beam lithography followed by oxygen plasma etching. Conductance measurements show a tendency of current saturation under high source-drain bias. In addition, we employ micro-Raman spectroscopy simultaneously with transport measurement on the current carrying device in vacuum. We observe an enhancement of the G-band anti-Stokes/Stokes intensity ratio, where the optical phonon temperature is estimated to be over $\sim 500\text{K}$ before device failure.

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Date submitted: 13 Dec 2007

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