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Ballistic Phonon Thermal Transport and Thermal Properties of Carbon Nanotubes HSIN-YING CHIU, y, VIKRAM DESHPANDE, HENK POSTMA, California Institute of Technology, CHUN NING LAU, University of California, Riverside, CSILLA MIKÓ, LÁSZLÓ FORRÓ, IPMC/SB, EPFL, CH-1015 Lausanne-EPFL, Switzerland, MARC BOCKRATH, California Institute of Technology — We report electrical transport experiments, using the phenomenon of electrical breakdown to perform thermometry, that probe the thermal properties of individual multiwalled carbon nanotubes. Our results show that nanotubes can readily conduct heat by ballistic phonon propagation. We determine the thermal conductance quantum, the ultimate limit to thermal conductance for a single phonon channel, and find good agreement with theoretical calculations. Moreover, our results suggest a breakdown mechanism of thermally activated C-C bond breaking coupled with the electrical stress of carrying 10^12 A/m^2. We also demonstrate a current-driven self-heating technique to improve the conductance of nanotube devices dramatically. The results of our ongoing experiments will be reported.

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