Abstract Submitted
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Large intrinsic energy band gaps in annealed nanotube-derived graphene nanoribbons[1] J. HARUYAMA, T. SHIMIZU, Aoyama Gakuin University, D.C. MARCANO, D.V. KOSINKIN, J.M. TOUR, Rice University, K. HIROSE, K. SUENAGA, AIST, Japan — The usefulness of graphene for electronics is diminished by an absent energy bandgap. While graphene nanoribbons have nonzero bandgaps, lithographic fabrication methods introduce defects which decouple the bandgap from electronic properties and compromise performance [1]. Here, we present direct measurements of a large intrinsic energy bandgap of approximately 50 meV in 100 nm-width level nanoribbons fabricated by high-temperature annealing of unzipped carbon nanotubes [2]. The activation energy is seven times greater than those in [1], and is close to the width of the transport gap in the differential conductance. This similarity suggests that the activation energy is in fact the intrinsic bandgap. High-resolution TEM and Raman spectroscopy, along with an absence of hopping conductance and stochastic charging effects, suggest a low defect density. [1] M.Y. Han, P. Kim et al., PRL 104, 056801 (2010) [2] J.Haruyama, J.M.Tour, et al., Nature Nanotech. (December 2010)

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