

Abstract Submitted  
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**Nonequilibrium dynamics of electrons and phonons: tailoring the transport properties of Carbon Nanotubes with encapsulated nanowires.**<sup>1</sup> ANDRIJ VASYLENKO<sup>2</sup>, University of Warwick, JAMIE WYNN, PAULO MEDEIROS, ANDREW MORRIS, University of Cambridge, JEREMY SLOAN, DAVID QUIGLEY, University of Warwick — Rapid saturation of electronic current in carbon nanotubes (CNTs) under bias voltage has been observed in several recent experimental and theoretical studies [1-5] This effect, caused by scattering with lattice vibrations, limits otherwise promising applications of CNTs in nanoelectronics. Here we propose a mechanism to enhancement electrical performance of metallic CNTs by encapsulation of one-dimensional nanowires. Although experimental studies of such structures are increasingly common [6-9], our first-principles study combined with the coupled electron-phonon dynamics is the first to explicitly demonstrate their enhanced functional performance relative to an empty metallic CNT. References: [1] A. Javey et al Phys. Rev. Lett., 92(10):106804, 2004. [2] J.-Y. Park et al Nano Lett., 4(3):517, 2004. [3] Z. Yao et al. Phys. Rev. Lett., 84(13):2941, 2000. [4] M. Amer et al Nano Res., 5(3):172, 2012. [5] M. Lazzeri et al. Phys. Rev. Lett., 95(23):236802, 2005. [6] J. H. Spencer et al ACS Nano, 8(9):9044, 2014.[7] R. Carter et al Dalton Transactions, 43(20):7391, 2014.[8] E. Philp et al Nat Mater, 2(12):788, 2003.[9] R. Senga et al. Nat Mater, 13(11): 1050, 2014.

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