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Boosting electronic transport in carbon nanotubes by isotopic disorder MICHELE LAZZERI, NIELS VANDECASTEELE, FRANCESCO MAURI, IMPMC, Paris, France — The current/voltage curve of metallic carbon nanotubes (CNTs) displays at high bias a sudden increase of the resistivity due to the scattering of electrons with phonons [1] having an anomalously-high population (hot phonons) [2,3]. Indeed, the rate at which hot-phonons are excited by the electrons is faster than the rate at which they are deexcited. Here, we show that it is possible to improve the electrical performances of metallic CNTs by 13C isotope enrichment. In fact, isotopic disorder creates additional channels for the hot-phonon deexcitation, reduces their population and, thus, the nanotube high-bias differential-resistance. This is an extraordinary case where disorder improves the electronic transport, with important technological consequences in view of the use of metallic CNTs as interconnects in future electronic devices. [1] Z. Yao et al., Phys. Rev. Lett. 84, 2941 (2000). [2] M. Lazzeri et al., Phys. Rev. Lett. 95, 236802 (2005); M. Lazzeri and F.Mauri, Phys. Rev. B 73, 165419 (2006). [3] M. Oron-Carl and R. Krupke, Phys. Rev. Lett. 100, 127401 (2008).

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