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Strong suppression of thermal conductivity in edgedisordered graphene nanoribbons: Order-N methodology and thermoelectric properties HALDUN SEVINCLI, Institute for Materials Science and Max Bergmann Center of Biomaterials, Dresden University of Technology, 01062 Dresden, Germany, WU LI, STEPHAN ROCHE, GIANAURELIO CUNIBERTI, Institute for Materials Science and Max Bergmann Center of Biomaterials, TU-Dresden, 01062 Dresden, Germany — We investigate electron and phonon transport through edge disordered graphene nanoribbons. Electronic transport is calculated using Green's functions[1] while for phonons we develop an efficient linear scaling method [2-3] which is based on the Chebyshev polynomial expansion of the time evolution operator and the Lanczos tridiagonalization scheme. We show that edge disorder dramatically reduces phonon thermal transport in both armchair and zigzag ribbons, while in zigzag graphene nanoribbons edge disorder is only weakly detrimental to electronic conduction. The behavior of the electronic and phononic elastic mean free paths points to the possibility of realizing an electron-crystal coexisting with a phonon-glass. The calculated thermoelectric figure of merit (ZT) values qualify zigzag graphene nanoribbons as a promising material for thermoelectric applications.

[1] H. Sevinçli and G. Cuniberti Phys. Rev. B 81, 113401 (2010). [2] W. Li, H. Sevinçli, G. Cuniberti and S. Roche, Phys. Rev. B 82, 041410 (2010). [3] W. Li, H. Sevinçli, S. Roche and G. Cuniberti, arXiv:1011.1116

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