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Electron-phonon coupling mechanism, Kohn anomalies and Peierls instabilities in two-dimensional graphite and single-wall carbon nanotubes[1] GEORGY SAMSONIDZE, Department of Physics, University of California at Berkeley and Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, EDUARDO BARROS, RIICHIRO SAITO, Department of Physics, Tohoku University and CREST JST, Sendai, 980-8578, Japan, HYUNGBIN SON, Department of Electrical Engineering and Computer Science, GENE DRESSELHAUS, Francis Bitter Magnet Laboratory, MILDRED DRESSELHAUS, Department of Electrical Engineering and Computer Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, MA 02139 — The electron-phonon coupling in two-dimensional graphite and metallic single-wall carbon nanotubes (SWNTs) is analyzed. The G'-band phonon mode opens a dynamical band gap that induces a Kohn anomaly in two-dimensional graphite, while truly metallic armchair SWNTs undergo Peierls transitions driven by the G- and G'-band phonon modes. The dynamical band gap induces a non-linear dependence of the phonon frequencies on the doping level and gives rise to strong anharmonic effects.

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