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First-Principles Calculations on the Effect of Doping and Biaxial Tensile Strain on Electron-Phonon Coupling in Graphene CHEN SI, Department of Physics, Tsinghua University, Beijing 100084, People's Republic of China, ZHENG LIU, Department of Materials Science and Engineering, University of Utah, Salt Lake City, Utah 84112, USA, WENHUI DUAN, Department of Physics, Tsinghua University, Beijing 100084, People's Republic of China, FENG LIU, Department of Materials Science and Engineering, University of Utah, Salt Lake City, Utah 84112, USA — Graphene has exhibited a wealth of fascinating properties, but is also known not to be a superconductor. Remarkably, we show that graphene can be made a conventional Bardeen-Cooper-Schrieffer superconductor by the combined effect of charge doping and tensile strain. While the effect of doping obviously enlarges the Fermi surface, the effect of strain profoundly increases the electron-phonon coupling. At the experimental accessible doping ($\sim 4 \times 10^{14}$ cm^{-2}) and strain ($\sim 16\%$) levels, the superconducting critical temperature T_c is estimated as high as ~ 30 K, the highest for a single-element material above the liquid hydrogen temperature.

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