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Origin of Superconductivity in Boron-doped Diamond KWAN-WOO LEE, WARREN E. PICKETT, University of California, Davis — Superconductivity of heavily boron-doped diamond having B concentration of 5×10^{21} cm^{-3}, reported at T_c=4 K by Ekimov *et al.*(April, 2004), is investigated exploiting its electronic and vibrational analogies to MgB_2. The deformation potential of the hole states arising from the C-C bond stretch mode is 60% larger than the corresponding quantity in MgB_2 that drives its high T_c, leading to very large electron-phonon matrix elements. The calculated coupling strength $\lambda \approx 0.5$ leads to T_c in the 5-10 K range and makes phonon coupling the likely mechanism. Higher doping should increase T_c somewhat, but effects of three dimensionality primarily on the density of states keep doped diamond from having a T_c closer to that of MgB_2.

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