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Oxygen isotope effects in $Ba_{1-x}K_xBiO_3$ high-temperature superconductors: Evidence for unconventional phonon-mediated pairing mechanism[1] NICHOLAS DERIMOW, VICTOR AGUILAR, ARMOND KHODAGULYAN, JACOB LABRY, GUO-MENG ZHAO, Department of Physics and Astronomy, California Sate University, Los Angeles, Los Angeles, CA 90032 — The microscopic pairing mechanism for high-temperature superconductivity in magnetic copper and iron-based superconductors remains elusive despite tremendous experimental and theoretical efforts. The electron-phonon coupling constants predicted from the local density approximation (LDA) are too small to explain high-temperature superconductivity. On the other hand, high-temperature superconductivity in non-magnetic bismuth-based superconductors is believed to be phonon-mediated while the electron-phonon coupling constant predicted from the LDA is also too small (about 0.30) to explain superconductivity. We report magnetic and thermal properties of the oxygen-isotope exchanged $Ba_{1-x}K_xBiO_3$ ($x = 0.37$ and 0.40) high-temperature superconductors to elucidate the pairing mechanism of this material. The deduced thermodynamic critical fields, electronic specific heat anomalies, superconducting transition temperatures, and magnetic penetration depths of the ^{16}O and ^{18}O samples are consistent with a phonon-mediated pairing mechanism with the effective electron-phonon coupling constant of about 1.0. We also show that the enhanced electron-phonon coupling constant may arise from the lattice polaronic effect, which increases the density of states at Fermi level.

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