Anomalous Isotope Effect in Low and High Tc Superconductors: the contribution of the electronic structure

G.L. ZHAO, Southern University and A&M College — Some of the low and high Tc superconductors exhibit an anomalous isotope effect, where the exponent ($\alpha$) for the isotope effect is much smaller than $1/2$. We present first-principles calculations of the electronic structures of the selected superconductors, including Zirconium (Zr) and YBa$_2$Cu$_3$O$_7$ (YBCO). The characteristically narrow electron bands around the Fermi levels ($E_f$) in these materials suggest that the rapid variations of the densities of states around $E_f$, within the range of phonon energy, can have a noticeable effect on the total coupling matrix elements. Such effect may explain the anomalous isotope effect on Tc in these superconductors. The work is funded in part by NSF and the Air Force Office of Scientific Research.