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The puzzle of anomalous isotope effect in high and low Tc superconductors

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Superconductors have zero electrical resistance and expulsion of magnetic fields below a critical temperature Tc. They can carry electric current without any energy loss and have many applications. However, understanding superconductivity is a great challenge. Especially, anomalously small isotope effect in some high Tc superconductors such as $YBa_2Cu_3O_7$ (YBCO) created a great challenge for understanding. To solve the puzzle, a new methodology is implemented by integrating first-principles calculations of electronic structures of the materials into the theory of many-body physics for superconductivity. The aim is to seek a unified methodology to study the electronic and superconducting properties of the materials. It is demonstrated from first-principles that the extended saddle point singularities in the electronic structure of some high and low Tc superconductors such as YBCO, Nb_3Sn, Zr, strongly correlate with the anomalous isotope effect in these superconductors. Some guidance for finding new high Tc superconductors will also be discussed.

Biography

Guang-Lin Zhao has completed two doctorate programs; first Doctor of Science degree in Low Temperature and Solid State Physics at the Institute of Physics, Chinese Academy of Sciences, Beijing, China and second PhD degree in Condensed Matter Physics at Iowa State University, Ames, Iowa, USA. He is currently working as a Professor of Physics at Southern University and A&M College, Louisiana, USA. He has published more than 100 research papers in reputed research journals and has been serving as a manuscript referee for 19 professional research journals.

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