

A new superconductor in spinel oxides

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Spinel compounds have demonstrated rich functionalities but rarely shown superconductivity. LiTi_2O_4 (LTO) discovered in 1973 was the only known spinel oxide superconductors [1]. Owing to a serious aging effect, not until stabilized LTO films were obtained did the research on this unique compound experience a renaissance. Several years ago we were able to synthesize high-quality LTO thin films, assisting in understanding the nature of this material. For instance, we find that there exists an orbital-related state above the superconducting transition, which may persist into the superconducting state, evident from the unusual relation between the energy gap and the magnetic field [2]. Such superconductor becomes more and more attractive because of its anomalies in el-ph coupling [3,4], magnetoresistance [5], and the upper critical field [6], but meanwhile, its sister material has been highly desired. In this talk, I will briefly review these achievements on LTO and then report our discovery of a spinel oxide superconductor, which was known to be a robust insulator. The superconductivity emerges by piling such material on top of another insulator and engineering the crystal lattice. The superconducting transition temperature can be tuned as the crystal lattice parameter is manipulated. In a word, the spinel oxide is providing a good platform to investigate the interplay between the superconductivity and other exotic states.

References

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