Colloquium

Department of Electrophysics, National Chiao Tung University

Electronic structure studies of low-Tc and high-Tc superconductors

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Host : Prof. Jung-Jung Su

Abstract: In this talk, the technique of angle-integrated and angle-resolved photoemission spectroscopy will be introduced as an experimental tool to study the electronic structure of materials. After a brief discussion on applications of ultra-violet and x-ray photoemission spectroscopy to study metal-insulator transitions and semiconductors, we use the technique to study the evolution of electronic structure of a variety of superconductors across their transition temperature (Tc). Examples including low-Tc elemental metals and oxides (Fig. 1)[1b], transition metal dichalcogenides[2], high-Tc copper oxides [3,4] and Fe-based superconductors (Fig. 2) [5] will be discussed. While some low-Tc superconductors can be explained by the simple Bardeen Cooper Schrieffer (BCS) model based on an isotropic electron-phonon coupling, the high-Tc copper oxides indicate the role of strong electron-electron correlations in superconductivity. The experimental results allow us to characterize weak-coupling to strong-coupling s-wave superconductivity, $d_{x^2-y^2}$ superconductivity, as well as the more exotic $d_{x^2-y^2}+is$ and an octet node type superconductivity.