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Distinct Fermi Surface Topology and nearly Isotropic Superconducting Gap in $A_xFe_{2-y}Se_2$ (A=K, Tl, Rb) Superconductors[1]

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High resolution angle-resolved photoemission measurements have been carried out to study the electronic structure and superconducting gap of the newly discovered $A_xFe_{2-y}Se_2$ [A=K, (Tl,K) and (Tl,Rb)] superconductors[1,2,3] 1. Distinct Fermi surface topology, consisting of two electron-like Fermi surface sheets around the $\Gamma(0,0)$ point and an electron-like Fermi surface sheet near the $M(\pi,\pi)$ point, was revealed in all these samples. This is in strong contrast to the Fermi surface topology of other Fe-based superconductors where hole-like Fermi surface sheets are present near the $\Gamma(0,0)$ point. 2. Both the electron-like Fermi surface sheet near M point and the large electron-like Fermi surface sheet near Γ point show nearly isotropic superconducting gap without nodes 3. The doping evolution of the electronic structure from insulating samples to the superconducting samples is consistent with a phase separation picture. The information on the Fermi surface topology and superconducting gap of this new $A_xFe_{2-y}Se_2$ superconductor will provide key insights and constraints to understand the superconductivity mechanism in iron-based superconductors.

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[1]Work done in collaboration with Daixiang Mou, Lin Zhao, Li Yu, Minghu Fang, G. F. Chen, X. L. Chen, Zuyan Xu and Chuangtian Chen