Neutron spin resonance study in Co-doped NaFeAs

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Since the discovery of iron superconductors, the (Ba,Sr,Ca)Fe2As2 (“122”) family especially electron doped side has been subjected to heavily study by neutron scattering. One of the pronounced features generally observed in bulk superconducting compositions is a broad resonance along antiferromagnetic order wave vector. The resonance energy linearly scales with Tc. However, our neutron study shows that Co-doped NaFeAs system exhibits complexity, distinguishing itself from “122” system. We observed a sharp resonance in the electron-overdope regime, providing strong evidence for S+ pairing symmetry in pnictide superconductors. In the underdoped regime, we find double resonances at commensurate wave vector, demonstrating the multi-orbital nature of pnictides. Our finding further suggests that the resonance energy and Tc may not be simply correlated in multiband superconductors such as iron pnictides. We will discuss in detail how resonances evolve with electron doping.

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