Multiband Eliashberg model for pnictides

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Existing experimental data demonstrate multiband character of ferropnictides. We study multiband Eliashberg model based on interband spin-fluctuation interaction. within this model, superconducting gap functions have different signs on electronic and hole pockets, the so-called $s_{\pm}$ symmetry state. Such a state have a number of interesting features which manifest themselves in thermodynamics and transport properties. Using 4-band model, with 2 electronic and 2 hole pockets, we have calculated energy gaps and specific heat. These results are in a good agreement with experiments on K-doped pnictides. Further, we have studied impurity scattering outside Born approximation and have shown that nonexponential temperature dependencies of superfluid density and NMR relaxation rate can be realized. The origin of this behavior is explained by the fact that $s_{\pm}$ state, which is gapped in the clean limit, turns gappless when sufficient amount of impurity scattering is introduced. We also provide arguments that $s_{\pm}$ state is more robust against nonmagnetic impurities compared to predictions of the standard pair-breaking theory.