Coexistence of Superconductivity and Spin Density Wave in Ferropnictide $Ba_{1-x}K_xFe_2As_2$

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Abstract : This work focuses on the theoretical investigation of the coexistence of superconductivity and Spin Density Wave (SDW)in Ferropnictide $Ba_{1-x}K_xFe_2As_2$. By developing a model Hamiltonian for the system and by using quantum field theory Green's function formalism, we have obtained mathematical expressions for superconducting transition temperature TC), spin density wave transition temperature (T_{sdw}), superconductivity order parameter (Sc), and spin density wave order parameter (sdw). By employing the experimental and theoretical values of the parameters in the obtained expressions, phase diagrams of superconducting transition temperature (TC) versus superconducting order parameter (Sc) and spin density wave transition temperature (T_{sdw}), versus spin density wave order parameter (sdw) have been plotted. By combining the two phase diagrams, we have demonstrated the possible coexistence of superconductivity and spin density wave (SDW) in ferropnictide $Ba_{1-x}K_xFe_2As_2$.