Study of Specific Heat in Iron Based Superconductors: A Theoretical Three-Orbital Model Analysis

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In the present work, we studied thermodynamic properties like specific heat in the superconducting state of iron pnictide superconductors. In these materials, the five 3d orbitals due to iron, Hund's coupling and electron correlations coexist and dominate electronic properties of these systems. Therefore, we have attempted theoretical analysis based on three orbitals per site tight-binding model Hamiltonian containing hopping between the orbitals, Hund's coupling and intra and inter orbital coulomb interaction. We have employed many body Green's function technique with in BCS mean field approximation to calculate the expressions of superconducting energy gap parameter and used this result to calculate the specific heat as a function of temperature and various parameters of the model Hamiltonian. Then we computed numerically specific heat jump as a function of Hund's coupling and electron correlation and incorporated pseudogap in the computation itself to analyze it's effect on specific heat jump, finally compared the results with the recent specific heat data and relevant data of Iron based superconductors.

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