

Abstract

Studies on superconductivity arising from doping a Mott insulator have become critical in the area of superconductivity. Within the framework of the Bose-Fermi-Hubbard model, we discuss the thermodynamic phase transition via specific heat in hole and electron doped high- T_C cuprate superconductors. By considering the interplay between the electrons (fermions) and cooper pairs (bosons), the main features of the temperature dependence of the specific-heat, are well reproduced. It is shown that a hump-like feature in the specific-heat appears at the superconducting transition temperature T_C , and then the specific-heat varies exponentially as a function of temperature for the temperatures $T > T_C$, and then the specific-heat varies exponentially as a function of temperature for the temperatures $T < T_C$. This is in consistency that at lower temperatures, a superconducting gap seems to open progressively. In particular, quantitatively, we report a specific heat value $\sim 4.6661 \times 10^{-3}$ eV/K for YBa₂Cu₃O₆ (YBCO), 4.6419×10^{-3} eV/K for La_{2-x}Sr_xCuO₄ (LSCO), 4.67×10^{-3} eV/K for Nd_{2-x}Ce_xCuO₄ (NCCO) and 4.662×10^{-3} eV/K for Pr_{2-x}Ce_xCuO₄ (PCCO) at their respective T_C values which are in favorable agreement with other recent research findings.