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Thermodynamic properties of underdoped $YBa_2Cu_3O_{6+x}$ cuprates for doping values $x \in (0.5, 0.9)$[1] P. SALAS, M. A. SOLIS, M. FORTES, Instituto de Fsica, UNAM, Mexico — We extend the Boson-Fermion superconductivity model to include layered systems, such as underdoped cuprate superconductors $YBa_2Cu_3O_{6+x}$, with $x \in (0.5, 0.9)$ ranging from underdoped to optimally doped. We model cuprates as a boson-fermion quantum gas mixture immersed in a layered structure, generated via a Dirac comb potential applied in one direction while the particles move freely in the other two directions. The optimum parameters of the system, which are the impenetrability of the planes and the paired fermion fraction, are obtained by minimizing the Helmholtz free energy and setting the experimental critical temperature T_c. Using this optimized scheme, we are able to predict the following thermodynamic properties of cuprates as a function of temperature: the entropy; the Helmholtz free energy; the electronic specific heat and the total specific heat for different doping values. Furthermore, we determinate the behavior of the jump height in the electronic specific heat, the normal electronic specific heat coefficient $\gamma(T_c)$, the quadratic α and cubic β terms of the specific heat for low temperatures, the ground state energy and the mass anisotropy as a function of doping. Comparison to experimental values reported is analyzed.

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