ABSTRACT

Magnetic impurities in superconductors suppresses the superconducting properties due to spin-flip pair-breaking by the isolated impurity spins. The superconductivity vanishes at certain critical concentration in the low concentration region, however, at higher concentration coexistence of superconductivity and magnetism is observed. At higher concentration, the presence of long range magnetic ordering may not be ignored. We, therefore, calculate the effect of spin ordering on the Curie temperature of metals with impurities within random phase approximation. The calculations are then extended to study the Kondo bound states by using Nagaoka decoupling approximation. We observe that the presence of spin ordering yields a Kondo bound state. Finally, we extend the calculations to study the effect of spin ordering on the critical temperatures and Curie temperature of ferromagnetic superconductors.

Below superconducting transition temperature T_c, thermal conductivity is mainly due to lattice vibrations. We, therefore, first show that the lattice thermal conductivity can be used to analyse the presence of impurities in the lattices. It is observed that the presence of dislocations in superconductors also leads to a deviation from T^3 - temperature dependence at very low temperatures. The

vibrating dislocations can be pinned down by the electrons. The electron-phonon interaction interferes with the static dislocations to give an interference term proportional to $\omega_{q\lambda}^{3}$. The thermal conductivity expressions are finally calculated with the earlier derived electron Green functions by using Maki's approach.