

pair of electrons in the bound state is less than the energy of the pair of electrons in free state. The difference of energy in the two states of the pair is binding energy of the pair. At temp. less than critical temp. electron-phonon-electron interaction is stronger than electron-electron coulomb interaction and so the valence electron tends to form the pair. Pairing is complete at absolute zero and completely broken at critical temp.

Energy Gap: - The energy difference between free state of the electrons (normal state) appears as the energy gap at the Fermi surface. The normal electron states are above the energy gap and the super-conducting electron states are below the energy gap of the Fermi-surface.

The energy gap is a function of temperature. The energy gap is maximum at absolute zero and it is zero at  $T = T_c$ . At the critical temp. the pairing is dissolved.

Across the energy gap there are many excited states for the super-conducting Cooper pairs. BCS theory thus predicts many electron-ground states as well as excited states for superconductors in range zero to  $T_c$  and in these states