Critical Magnetic Field (Bc , Hc): The magnetic field required to convert the superconductor into a conductor at known temperature is known as critical magnetic field (Bc). The quantity of critical magnetic field depend on matter quality and temperature. Experimentally found that that Bc value at different temperature formed parabolic curve at B-T curve show fig (3).

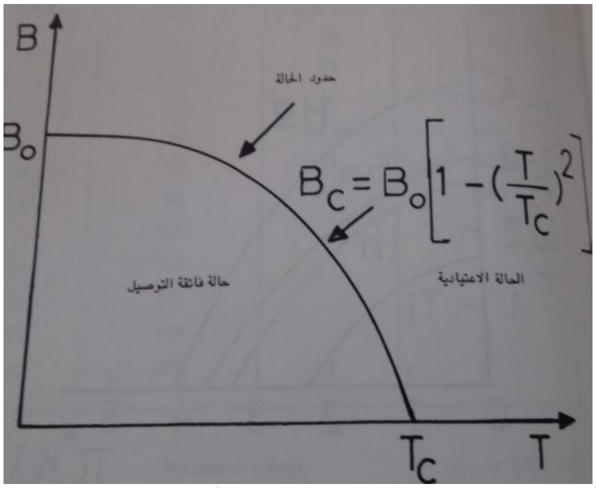

Fig (3): Varies of external magnetic field with temperature for I-type

$$\boldsymbol{B_c = B_o[1 - \left(\frac{T}{T_c}\right)^2] - - - - \rightarrow (1)}$$

B_o maximum value of critical magnetic field at zero kelvin, T: temperature , T_c critical temperature. If we see Fig(2) Bc become zero at $T=T_c$ and increase gradually دريجيا as the temperature decreases about T_c .

Superconducting materials exhibit the following unusual behaviors:

1. Zero resistance. Below a material's Tc, the DC electrical resistivity ρ is really zero, not just very small. This leads to the possibility of a related effect,

2. Persistent currents. If a current is set up in a superconductor with multiply connected topology, e.g. a tourist will flow forever without any driving voltage. (In practice experiments have been performed in which persistent currents flow for several years without signs of degrading).

3. Perfect diamagnetism. A superconductor expels a weak magnetic field nearly completely from its interior(screening currents flow to compensate the field within a surface layer of a few 100 or 1000 A, and the field at the sample surface drops to zero over this layer).

4. Energy gap. Most thermodynamic properties of a superconductor

are found to vary as$[e^{\frac{\Delta}{K_\beta T}}]$ indicating the existence of a gap, or energy interval with no allowed Eigen energies, in the energy spectrum. Idea: when there is a gap, only an exponentially small number of particles
have enough thermal energy to be promoted to the available unoccupied states above the gap. In addition, this gap is visible in electromagnetic absorption: send in a photon at low temperatures (strictly speaking,
T = 0), and no absorption is possible until the photon energy reaches 2Δ,
i.e. until the energy required to break a pair is available
Fig (4)

Perfect Conductor R=0 Perfect Diamagnetic B=0