Meissner Effect In superconductors

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Abstract :

In this scientific paper has a summary study of one of the themes of the modern scientific a Meissner effect, It is the expulsion of a magnetic field from the interior of a material that is in the process of becoming a superconductor, that is, losing its resistance to the flow of electrical currents when cooled below a certain temperature, called the transition temperature, usually close to absolute zero. The Meissner effect, a property of all superconductors, As a superconductor in a magnetic field is cooled to the temperature at which it abruptly loses electrical resistance, all or part of the magnetic field within the material is expelled.

Introduction:

In the current study, we will focus on explaining the Meissner Effect but before we go deeper we will learn about superconductor materials and what is it meant of superconductivity. Superconductors property of complete disappearance of electrical resistance in solids when they are cooled below a characteristic temperature. This temperature is called transition temperature or critical temperature, Tc [1].

The phenomenon was discovered by Heike Kamerlingh Onnes in 1911when he was studying the properties of mercury at liquid helium temperatures . Meissner effect essentially describes the response of a superconducting material when placed in a magnetic field. It was discovered by W. Meissner and R. Ochsenfeld in Germany in 1933 . They found that the magnetic field inside superconductor is always zero [3].

Meissner effect essentially describes the response of a superconducting material when placed in a magnetic field. Superconductivity was discovered in 1911 by the Dutch physicist Onnes Kamerlingh Onnes found that the electrical resistivity of a mercury wire disappears suddenly when it is cooled below a temperature of about 4 K (−269 °C); absolute zero is 0 K.

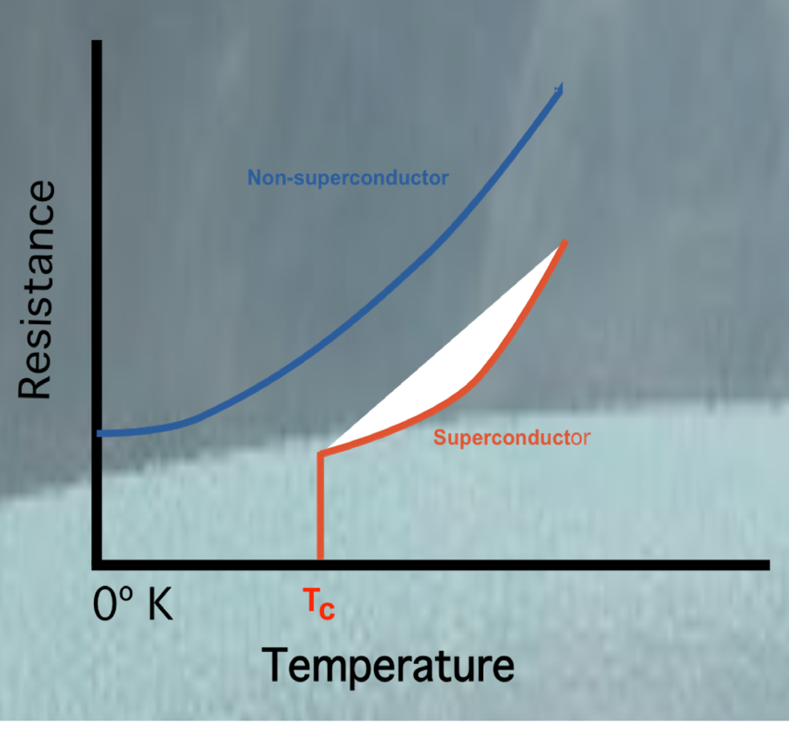
It has been tested in a wide range of experiments, involving, for example, ultrasonic absorption studies, nuclear-spin phenomena [4]

Theory:

If a strong permanent magnet above the disk of a substance superconducting passes by an electric current and therefore generates a magnetic field with permanent magnet so that eliminates weight and become suspended air (2).this phenomenon Can be described as follows. At T>Tc The material is in normal state When external magnetic field Is turned on the external magnetic Field penetrates through the material on the basis of faraday's law

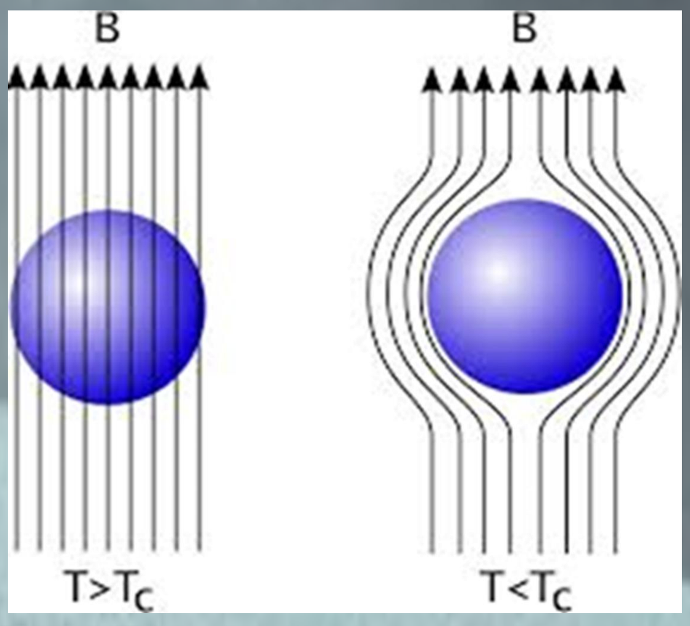
$$\oint \overrightarrow{E}.\, d\vec{l} = -\frac{d\phi}{dt}.$$

Thermal properties of superconductors



But at T<Tc the magnetic field would remain trapped in the material after the external field has been turned off. The trapping of the magnetic field does not happen (the absence of the magnetic field inside the superconductor is the Meissner effect). The magnetic field is expelled from the interior of the superconductor, inside the superconductor B=0.

Superconductor expels magnetic field from the interior by setting up an electric current at the surface. The surface current creates a magnetic field that exactly cancels the external magnetic field.



Conclusions:

In this project, we will study superconductors and their influence on the magnetic field through the survival of permanent magnets hung when placed above the super-material conductivity refrigerated contribute nitrogen means a phenomenon in which certain metals lose their resistance to internal validity of Electricity at temperatures Approaching absolute zero. This phenomenon is applied to the magnetic train bird in China do not contain mechanical drives or walks on the iron bars it floats in the air, relying on a magnetic cushion [6].

References :

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