Magnetic Susceptibility of a solid

Chirag Verma
Course : B.Sc. (H) Physics - III year
College Roll Number: 31830172
University Roll Number : 18036567028

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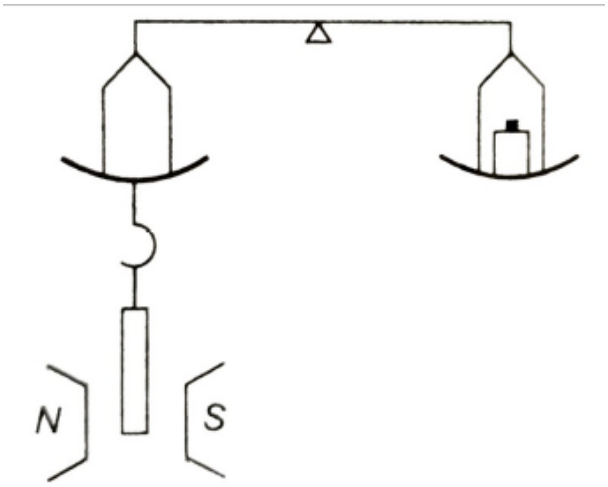
Instructor: Dr. Sangeeta Gadre

Aim

To determine the magnetic susceptibility of a solid

Diagram



Theory

This method depends on the force exerted on a body placed in a non-homogeneous magnetic field. The variable magnetic field is provided by an electromagnet with wedge shaped pole pieces. Figure illustrates the experimental set-up. The field of the magnet varies rapidly along the vertical direction, due to the wedging of the pole pieces. Thus, the force on the specimen is vertical. In this experiment the influence of the earths field is neglected. The specimen whose magnetic susceptibility is to be determined is connected to one arm of a sensitive balance is enclosed in a box so that the air does not affect the weighing.

There is a hole in the box through which the specimen hangs out. It is hung in the field between the pole pieces of the magnet in such a way that its lower end is in a homogeneous magnetic field B and the upper end is in a much weaker field. The force resulting from the field is counter balanced by altering the weights in the other pan of the balance. If the difference is denoted by mg, this is equal to the force arising from the magnetic field.

Formula Used

$$mg = \frac{1}{2\mu_0}\chi AB^2 \tag{1}$$

where A is the area of the substance in m^2, g is the acceleration due to gravity, and $\mu_0 = 4\pi \cdot 10^{-7}$W/A-m.