**Aim: -**To study the Hall Effect and to calculate:-

(i) The Hall Coefficient $R_H$

(ii) The concentration of charge carrier n

**Apparatus:-**Power supply for electromagnets, Gauss meter with hall probes, p typeGe semiconductor on PCB, multimeter, electromagnets.

**Theory:-**A current carrying conductor (semiconductor/metal) is placed in the magneticfield perpendicular to the direction of current; a voltage is developed acrossthe conductor in a direction perpendicular to both the current and magneticield. The effect is known is as Hall Effect. This effect is very useful in determining-

> The nature of charge carries e.g. whether semiconductor is on n-type or p-type

> Carrier concentration or the no. density of charge carries

> Mobility of charge carriers

**Formula:-Hall Coefficient** $R_H = \left(\frac{V_H}{I}\right)\frac{W}{B}$ , **Carrier Concentration** $n = \frac{1}{eR_H}$

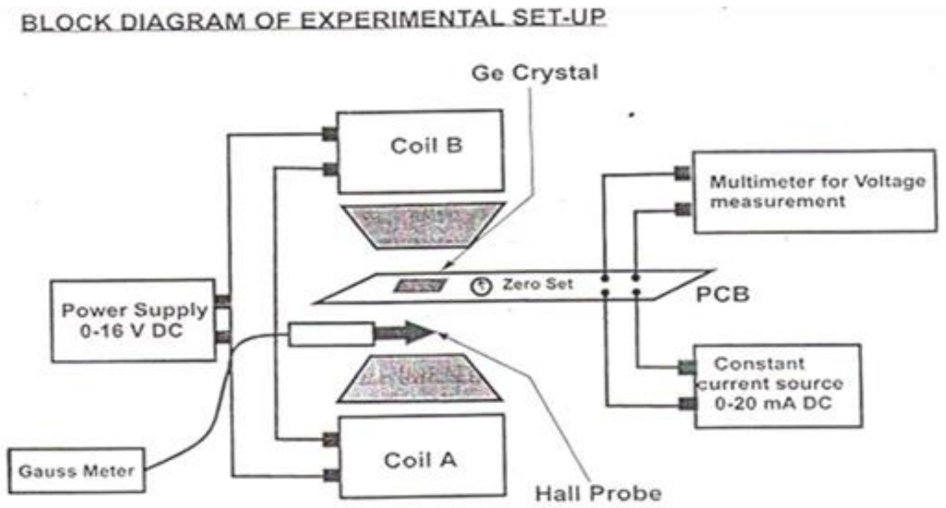


Fig. 2

**Procedure:-**

(1) Connect one pair of contact of specimen on the opposite faces to the current source and other pair to the multimeter.

(2) Switch on the power supply of electromagnet and measure the magnetic flux density at the centre between the pole faces by placing

(3) Place the specimen at the centre between the pole faces such that the magnetic field is perpendicular to the strip.

(4) Pass the current (mA) from the current source through the specimen and measure the resulting hall voltage in the multimeter / milivoltmeter.

(5) Increase the current through the specimen gradually and measure the corresponding Hall voltages.

(6) The entire process can be repeated for different values of magnetic flux density. Find the mean of different $R_H$

**Precautions**:-

1. Before starting the experiment, check the gauss meter is showing zero value. For this put the prove in separate place and switch on the gauss meter, it will show zero meter.
2. Ensure that the specimen is located at the centre between the pole faces and is exactly perpendicular to the magnetic field.
3. To measure the magnetic flux the hall probe should placed at the center the pole faces, parallel to the crystal.
4. Check the direction of electromagnet coils so that it generates the maximum magnetic field, this can be check by placing the soft iron near the generated magnetic field, if soft iron attracts forcefully the magnetic field produced is strong, otherwise magnetic field is weak.

**Observation Table:-**

Thickness of the specimen (W) = $5 \times 10^{-2}$ cm

Conductivity($\sigma$)=0.1 coulomb volt$^{-1}$ sec$^{-1}$cm$^{-1}$

Current through the Electromagnet (I) = _______Amp

Magnetic flux density (B) =_______Gauss

| **Sr.No.** | **Current through the Specimen I [mA]** | **Voltage $V_H$ [mV]** | **Hall Coefficient [$R_H$ ] X $10^8$( $cm^3$ $coulomb^{-1}$)** |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

**Calculation:-** Hall Coefficient $R_H = \left(\frac{V_H}{I}\right)\frac{w}{B}$

Carrier Concentration $n = \frac{1}{eR_H}$

Carrier Mobility $\mu = R_H \sigma$

**Result:-** Hall Coefficient (Mean $R_H$) =_________ $cm^3\ coulomb^{-1}$

Carrier Concentration n=_________$cm^{-3}$

Carrier Mobility $\mu$ = ___________ $cm^2\ volt^{-1}\ sec^{-1}$

**Conclusion:**

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________