WELCOME!

PRESENTATION BY

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THE HALL EFFECT

ABSTRACT

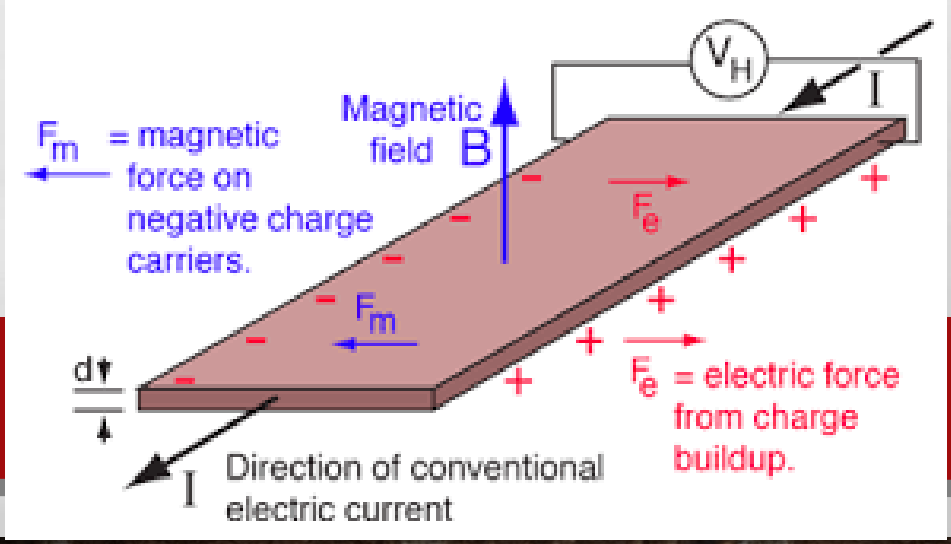
- DISCOVERY.
- WHAT IS HALL EFFECT?
- THEORY.
- HALL COEFFICIENT.
- APPLICATIONS.
- AIM, APPARATUS, FORMULA.
- DIAGRAM, OBSERVATION TABLE.
- RESULT.
- CONCLUSION.

DISCOVERY

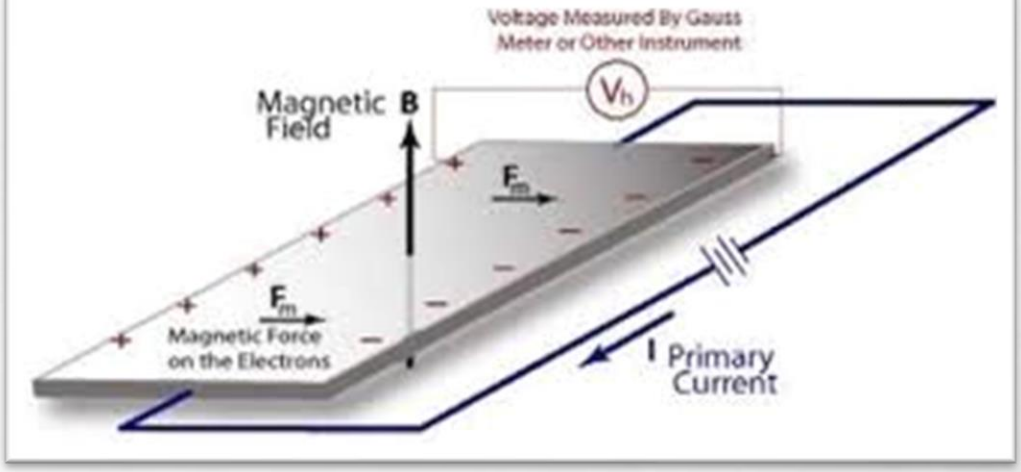
- THE HALL EFFECT WAS DISCOVERED IN 1879 BY EDWIN HERBERT HALL WHILE WORKING ON HIS DOCTORAL DEGREE AT THE JOHNS HOPKINS UNIVERSITY IN BALTIMORE, MARYLAND, USA.
- DISCOVERED 18 YEARS BEFORE THE ELECTRON.

WHAT IS HALL EFFECT?

- THE HALL EFFECT IS THE PRODUCTION OF A VOLTAGE DIFFERENCE (THE HALL VOLTAGE) ACROSS A CURRENT CARRYING CONDUCTOR (IN PRESENCE OF MAGNETIC FIELD), PERPENDICULAR TO BOTH CURRENT AND THE MAGNETIC FIELD.



THEORY



- WHEN A CURRENT-CARRYING CONDUCTOR IS PLACED INTO A MAGNETIC FIELD, A VOLTAGE WILL BE GENERATED PERPENDICULAR TO BOTH THE CURRENT AND THE FIELD.
- WHEN A PERPENDICULAR MAGNETIC FIELD IS PRESENT. A LORENTZ FORCE IS EXERTED ON THE ELECTRON. DUE TO WHICH ELECTRON MOVES IN PERPENDICULAR DIRECTION TO BOTH CURRENT AND MAGNETIC FIELD. AND DEVELOP A POTENTIAL DIFFERENCE ACROSS THE CONDUCTOR OR SEMICONDUCTOR.

HALL VOLTAGE AND HALL COEFFICIENT

- CREATES INTERNAL ELECTRIC POTENTIAL, KNOWN AS HALL VOLTAGE. $V_H = \frac{B \times I}{n \times e \times d}$

WHERE 'D' IS THE THICKNESS OF THE SEMICONDUCTOR ALONG THE DIRECTION OF MAGNETIC FIELD.

- $R_H = \frac{V_H}{H} \times \frac{W}{I}$

APPLICATIONS

- USED AS MAGNETOMETERS, I.E. TO MEASURE MAGNETIC FIELD.
- HALL EFFECT SENSOR IS ALSO USED AS CURRENT SENSOR.
- MAGNETIC POSITION SENSING IN BRUSHLESS DC ELECTRIC MOTORS.
- AUTOMOTIVE FUEL LEVEL INDICATOR.

AIM

- TO STUDY THE HALL EFFECT AND TO FIND OUT HALL COEFFICIENT AND TO DETERMINE THE CONNECTION OF CHARGE CARRIER IN GIVEN SEMICONDUCTOR.

APPARATUS

- HALL PROBE (GE CRYSTAL), ELECTROMAGNET, DC POWER SUPPLY, GAUSS METER, MILLIAMMETER, MILLIVOLTMETER ETC.

FORMULAE

- $R_H = \frac{V_H}{H} \times \frac{W}{I}$
- $\eta = \frac{1}{R_H.e.c}$
- $R_H = SLOPE \times \frac{W}{I}$

WHERE, R_H = HALL COEFFICIENT

$V_H = Hall\ voltage$

W = THICKNESS OF CRYSTAL = 0.05 M

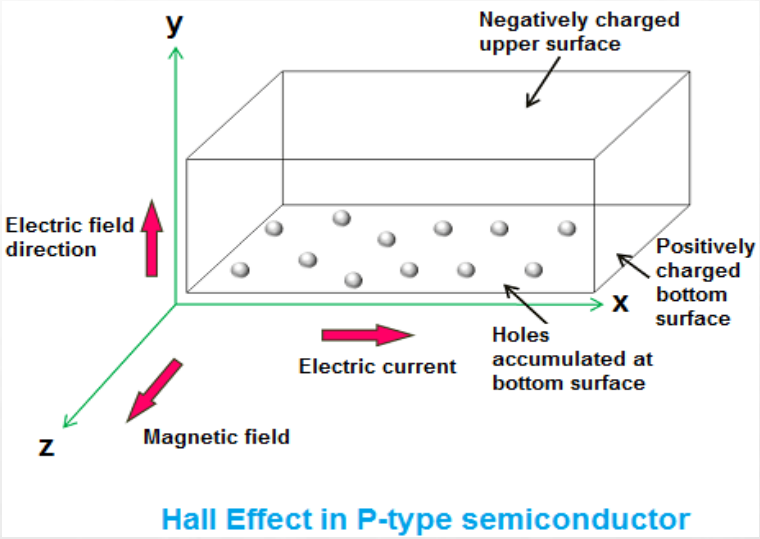
I = CURRENT THROUGH HALL PROBE

H = INTENSITY OF MAGNETIC FIELD

E = ELECTRONIC CHARGE = 1.6×10^{-19} C

C = VELOCITY OF LIGHT = 3×10^8 M/S

EXPERIMENTAL SETUP

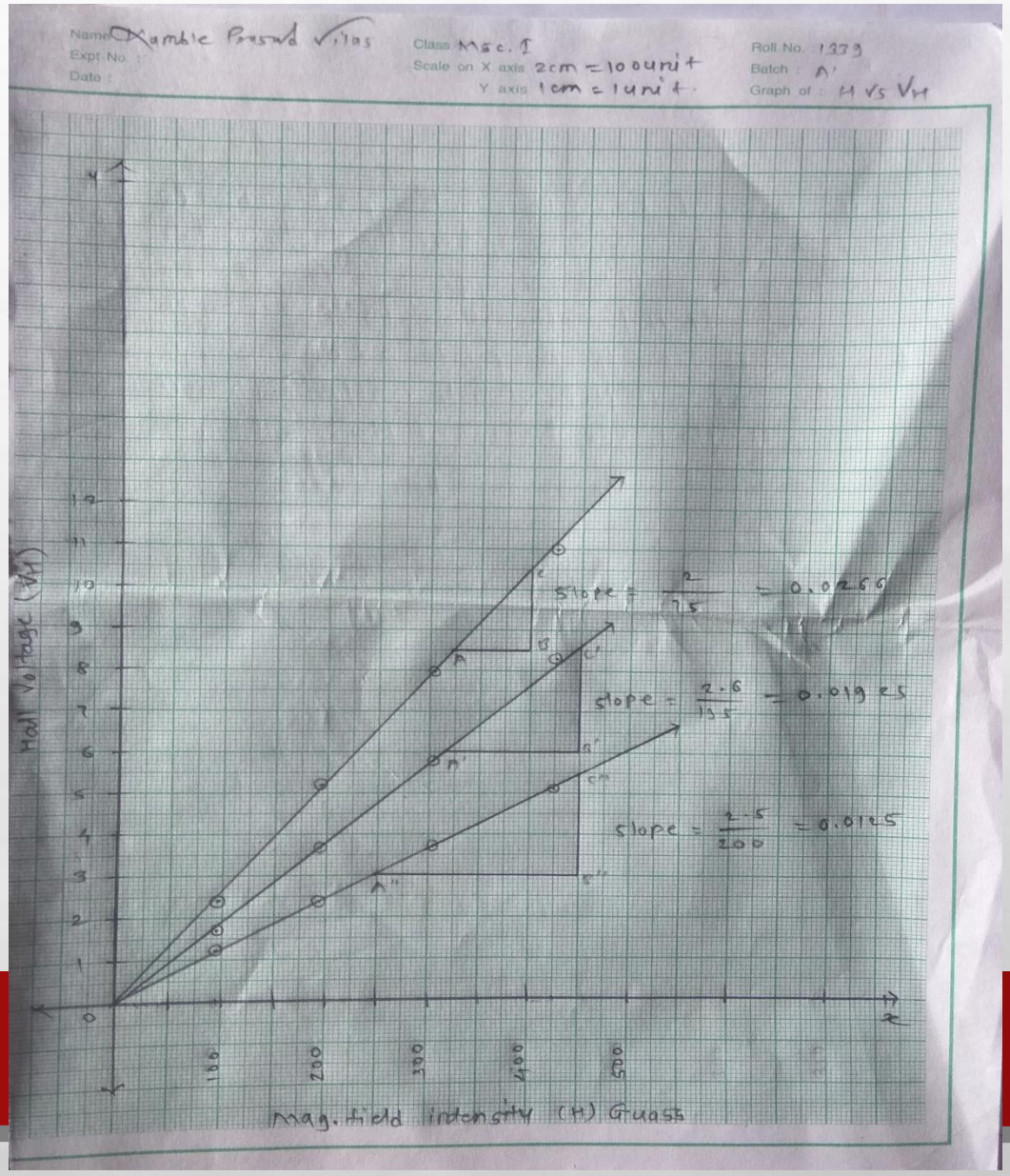


Hall Effect in P-type semiconductor

OBSERVATION TABLE

OB NO.	CURRENT THRO'HALL PROBE (mA)	CURRENT THRO' MAGNETIC COIL (Ampere)	HALL VOLTAGE ,ΔV_H (Mv)	MAGNETIC FIELD INTENSITY 'H' GAUSS	HALL COEFFICIENT V.Cm/amp R_H GAUSS	AVERAGE MEAN 'R_H'
01		0.50	1.2	96	1.25×10^{-3}	
02	0.50	1.00	2.4	197	1.21×10^{-3}	1.2175×10^{-3}
03		1.5	3.7	305	1.21×10^{-3}	
04		2.00	5.1	426	1.20×10^{-3}	
01		0.5	1.7	96	1.180×10^{-3}	
02	0.75	1.00	3.7	197	1.252×10^{-3}	1.2490×10^{-3}
03		1.5	5.8	305	1.262×10^{-3}	
04		2.00	8.3	425	1.301×10^{-3}	
01		0.5	2.4	96	1.250×10^{-3}	
02	1.00	1.00	5.2	197	1.309×10^{-3}	1.291×10^{-3}
03		1.5	8.0	305	1.311×10^{-3}	
04		2.00	11.0	425	1.294×10^{-3}	

GRAPH


Name: Kumble Prasad Vilas
Class: M.Sc. I
Roll No. 1339
Expt. No.:
Scale on X axis 2cm = 100 unit
Batch: A'
Date:
Y axis 1cm = 1 unit
Graph of: H Vs VH
Hall Voltage (VH)
Mag. field intensity (H) Guass
slope = 2/75 = 0.026
slope = 2.6/135 = 0.019 ≈ 5
slope = 2.5/200 = 0.012 5

RESULT

- HALL COEFFICIENT (R_H) :

  BY CALCULATION = 1) 1.2175×10^{-3} CM^{-3}

  2) 1.2490×10^{-3} CM^{-3}

  3) 1.291×10^{-3} CM^{-3}

  BY GRAPH = 1) 1.2×10^{-3} CM^{-3}

  2) 1.2380×10^{-3} CM^{-3}

  3) 1.30×10^{-3} CM^{-3}

- CARRIER CONC^{N} (n) :

  BY CALCULATION = 1) 1.7111×10^{-3} CM^{-3}

  2) 1.6680×10^{-3} CM^{-3}

  3) 1.6130×10^{-3} CM^{-3}

  BY GRAPH = 1) 1.7361×10^{-3} CM^{-3}

  2) 1.6828×10^{-3} CM^{-3}

  3) 1.6013×10^{-3} CM^{-3}

CONCLUSION

- HALL VOLTAGE IS POSITIVE THEN HALL COEFFICIENT WILL BE NEGATIVE AND VICE VERSA.
- WHEN WE INCREASE MAGNETIC FIELD INTENSITY 'H' THEN THE HALL VOLTAGE (V_H) ALSO INCREASES.

THANKYOU