

**EXPERIMENT
NUMBER – 2**

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Semester 2nd

UID: 20BCS2761
Section/Group: 26 B
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AIM OF THE EXPERIMENT – To determine the resistivity of the semiconductor by four probe method.

APPARATUS –

S. NO.	EQUIPMENT	RANGE	QUANTIT Y
1.	Four probe Arrangement	NA	1
2.	OVEN	0-200 C	1
3.	Constant current generator	0-200mA	1
4.	Digital panel meter	NA	1
5.	Oven power supply	12 V	1

OBSERVATIONS –

- (i) Distance between the probes (s) = 0.2 cm
- (ii) Thickness of the crystal chip (W) = 0.05cm
- (iii) Current (I) = 25mV (Constant)

From standard table $f(w/S) = 5.89$

Obs . No.	Temperature in C	Temperature in K	Voltage V in (mV)	Resistivity in (ohm-cm)
1.	40	313	666.1	5.6816
2.	45	318	648.2	5.5289
3.	50	323	631.2	5.3839
4.	55	328	615.3	5.2483
5.	60	333	600.1	5.1186

CALCULATIONS-

$$P_0 = \frac{P_0}{f\left(\frac{\omega}{s}\right)}$$

$$P_0 = \frac{V}{I} \times 1.256$$

$$f\left(\frac{\omega}{s}\right) = 5.89$$

$$\rightarrow P_0 = \frac{666.1}{25} \times 1.256 = 33.464$$

$$P_1 = \frac{P_0}{f\left(\frac{\omega}{s}\right)} = \frac{33.464}{5.89} = \boxed{5.6816}$$

$$\rightarrow P_0 = \frac{648.2}{25} \times 1.256 = 32.565$$

$$P_1 = \frac{P_0}{f\left(\frac{\omega}{s}\right)} = \frac{32.565}{5.89} = \boxed{5.5289}$$

$$\rightarrow P_0 = \frac{631.2}{25} \times 1.256 = 31.711$$

$$P_1 = \frac{P_0}{f\left(\frac{\omega}{s}\right)} = \frac{31.711}{5.89} = \boxed{5.3839}$$

$$\rightarrow P_0 = \frac{615.3}{25} \times 1.256 = 30.912$$

$$P_1 = \frac{P_0}{f\left(\frac{\omega}{s}\right)} = \frac{30.912}{5.89} = \boxed{5.2483}$$

$$\rightarrow P_0 = \frac{600.1}{25} \times 1.256 = 30.149$$

$$P_1 = \frac{P_0}{f\left(\frac{\omega}{s}\right)} = \frac{30.149}{5.89} = \boxed{5.1186}$$

RESULT AND DISCUSSION :-

The resistivity of the given semiconductor by four probe method of different temperature is 5.6816,5.5289,5.3839,5.2483,5.1186 ohm- centimeter.

The experiment was concluded that resistivity of semiconductors depends upon the temperature of the material.

SOURCES OF ERRORS:-

1. The resistivity of the material should be uniform in the area of measurement.
2. The surface on which the probes rest should be flat with no surface leakage.
3. The diameter of the contact between the metallic probes and the semiconductor crystal chip should be small compared to the distance between probes.

CONCLUSION:-

The experiment was concluded and proven that the band gap energy between the conduction band and the valance band.

LEARNING OUTCOMES

- It will provide the modest experience that allows students to develop and improve their experimental skills and develop ability to analyze data.
- Ability to demonstrate the practical skill on measurements and instrumentation techniques of some Physics experiments. Students will develop the ability to use appropriate physical concepts to obtain quantitative solutions to problems in physics.
- Students will demonstrate basic experimental skills by setting up laboratory equipment safely and efficiently, plan and carry out experimental procedures, and report verbally and in written language the results of the experiment.
- Students will develop skills by the practice of setting up and conducting an experiment with due regard to minimizing measurement error.

EVALUATION COLUMN (To be filled by concerned faculty only)

Sr. No.	Parameters	Maximum Marks	Marks Obtained
1.	Worksheet completion including writing learning objectives/Outcomes. (To be submitted at the end of the day)	10	
2.	Post Lab Quiz Result.	5	
3.	Student Engagement in Simulation/Demonstration/Performance and Controls/Pre-Lab Questions.	5	
4.	Total Marks	20	
5.	Teacher's Signature (with date)		