

UNIT IV

Optical properties of Materials

4.3.Photo Current In PN Diode

It is reversed biased P-N junction diode which responds to light radiation Light ( $h\nu$ )

4.3.1Principle:

When light is incident on the reversed biased P-N junction the concentration of minority carriers increases. Thus it increases the reverse current.

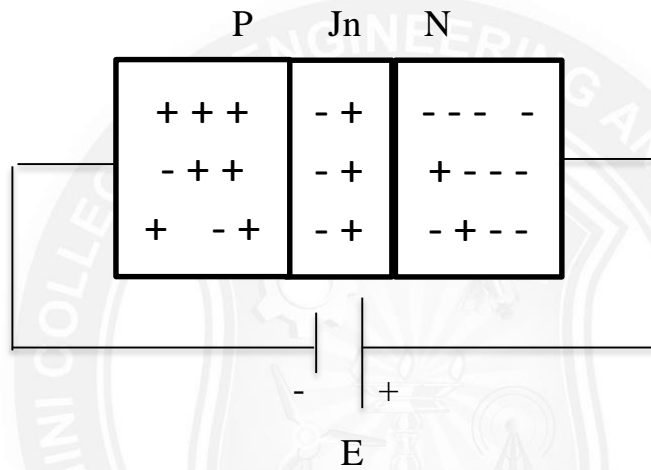


Fig 4.3.1 PN junction diode (reversed biased)

4.3.2Construction:

It consists of P-N junction diode which is placed in a transparent capsule. Light is allowed to fall on the surface of the junction as shown in fig a. The symbol is shown in the below figure b

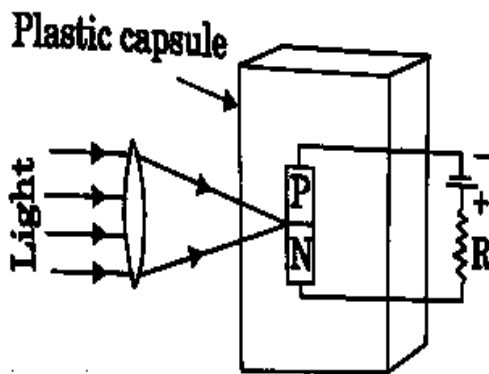


Fig 4.3.2.Photo diode diode



Fig 4.3.3.Symbol

4.3.3.Working:

Initially the diode is placed in a dark room and reversed biased. It produces a reverse saturation current due to thermally generated minority carriers. It is called dark current ( $I_d$ ).

Now the light is allowed to fall on the junction to produce electron hole pair. This produces an additional current.

Under reverse bias condition

$$\text{Total current } I = I_s + I_d$$

$I_s$  -Short circuit current and is proportional to intensity of light.

#### 4.3.5.Voltage current characteristics(V-I)

The volt ampere characteristics of the photo diode is shown in the fig

- (i) The current increases with the illumination of light.
- (ii) Only for dark current at zero voltage the current  $I_s$  is zero.

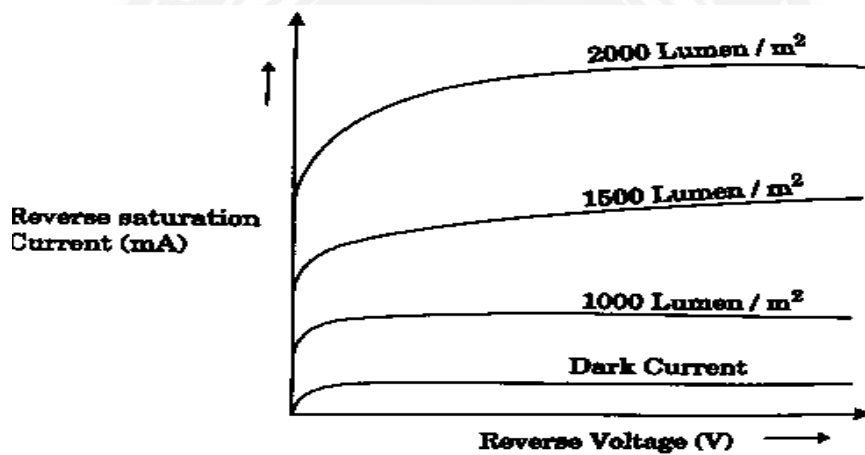


Fig 4.4.5.V-I characteristics

#### Applications:

It is Used in

- 1.Light detection system
- 2.Reading of sound track in film
- 3.light operated switches.
- 4.High speed reading of computer