Optical Sensor (2B)

- Light
- Electromagnetic Wave
- Photo-conductive Effect
- Photo-voltaic Effect
- Photo-electric Effect
- Pyro-electric Effect
- Thermo-electric Effect

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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Light

Wavelength	
1 ~ 390 nm	UV
390 ~ 780 nm	Visible Light
0.78 ~1000 μm	IR
0.78 ~ 2.5 μm	Near IR
2.5 ~ 50 μm	IR
50 ~ 1000 μm	Far IR

Electromagnetic Wave

$$speed = \frac{distance}{time}$$

$$c = \lambda \nu$$

c : *speed of light*
λ : *wave length*
ν : *frequency*

Energy of a photon

$$E_{ph} = h\nu = \frac{hc}{\lambda}$$

h : *Planck constant*

Emission and Absorption of a Photon

Photo-conductive Effect

High

Conduction Band *few electrons*

Forbidden Band *no electrons* E_g

Valence Band *many electrons*

Low

After absorbing light

free electron : Valence Band ⟶ Conduction Band

Photo-voltaic Effect

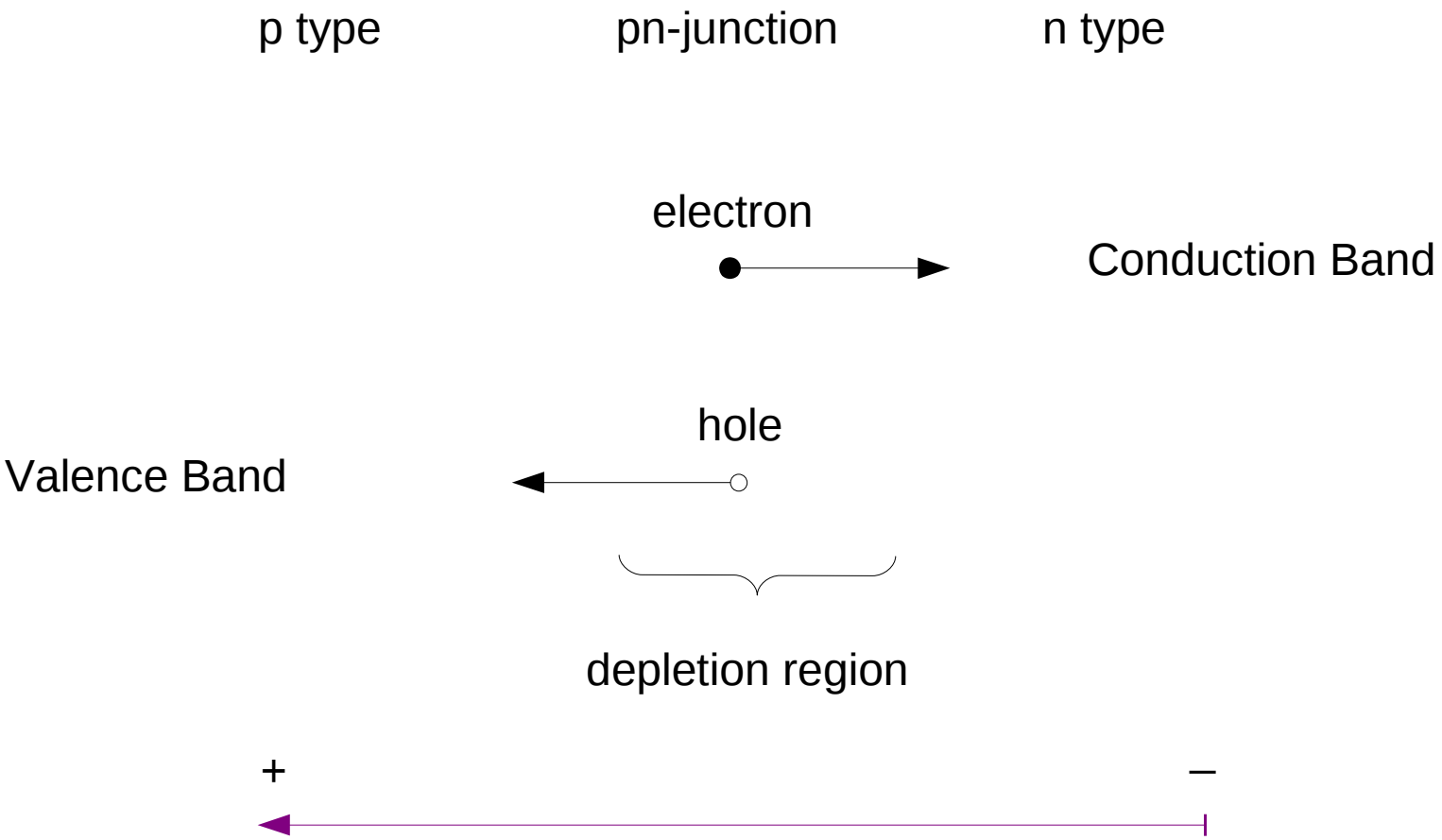
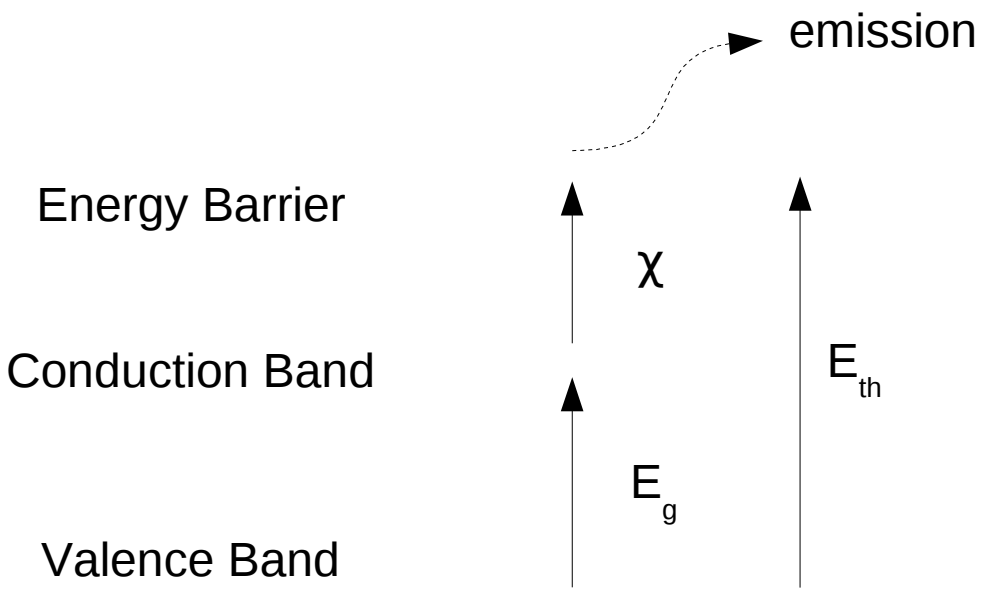
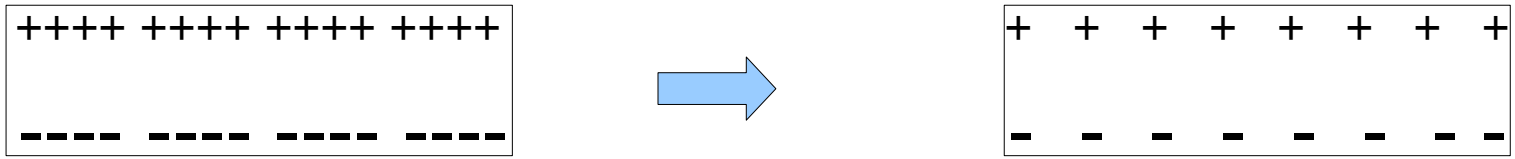


Photo-electric Effect



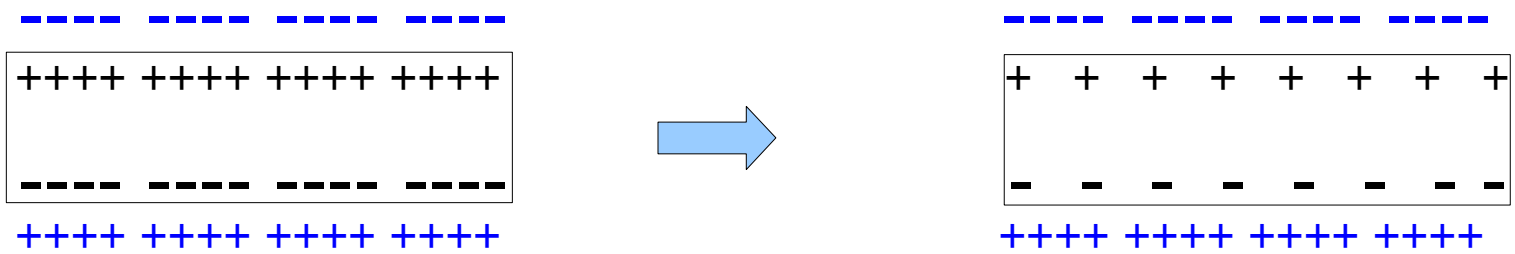
Pyro-electric Effect

Spontaneous Polarization



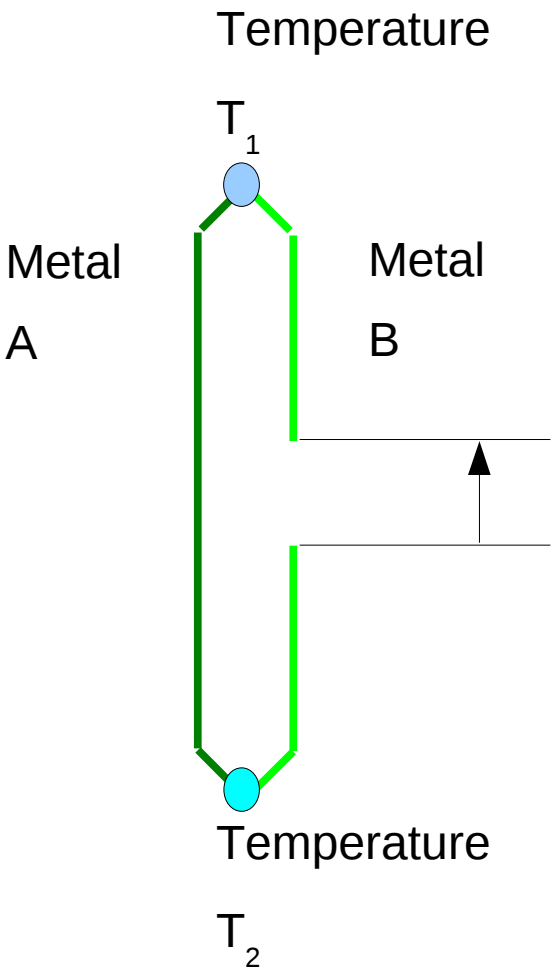
Increasing

Temperature



Pyro-electric Effect

Temperature difference → electricity



$$V \propto (T_2 - T_1)$$

References

[1] http://en.wikipedia.org/
[2] Nam Ki Min, Sensor Electronics, Dong-il Press