

{ B.Sc Part II (PHYSICS HONS) }
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Question: Define Peltier's effect and Thomson's effect and its co-efficient and causes?

Ans:- Peltier effect:->

When an electric current is passed through a thermocouple, heat is either absorbed or released at the junctions, depending on the direction of current flow. This effect is called Peltier effect. When the direction of the current is reversed in thermocouple, the heat evolved or absorbed or interchanged at the junction. This effect is an inverse process of Seebeck effect.

Peltier Co-efficient:->

Peltier Co-efficient at any temp for the junction of two metals is the product of absolute temp. and thermoelectric power at the temperature. Peltier's co-efficient denoted by π

$$\pi = TP$$

$$\text{or } \pi = T \frac{dE}{dT}$$

cause of Peltier Effect:->

If two dissimilar metals are joined, contact potential is established at the junctions, i.e. the potential of one must become above that of the other. For exp:- In Cu-Fe thermocouple, the potential of Fe is greater than the potential of Cu. At one junction, current flows from lower potential to higher potential and the energy are required for this purpose, which is absorbed from the junction and hence it is cooled. At another junction, current flows from higher potential to lower potential. The energy is given out at this junction and makes the junction hot.

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Thomson's Effect →

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The phenomenon of evolution or absorption of heat along the length of a conductor on passing current through it when its two ends are kept at a difference temp is known as Thomson's effect.

If an electric current is passed through a Cu-wire from its hotter end to the colder end and heat is evolved and the wire becomes hot. If the current is reversed, heat is absorbed along the conductor. Similarly, if an electric current is passed through an iron wire from its hotter ends to the colder end, the heat is absorbed and the wire gets cooled. If the current is reversed, the heat is evolved along the conductor. So Thomson's Effect is reversible. The substances which behaves like Cu are said to have positive Thomson's effect. The substances which behaves like Fe are said to have negative Thomson's effect. Thomson's effect of lead is nil. So it is used as the standard metal in thermoelectricity.

