

### Thermoelectric Power (P) or Seebeck Coefficient (S):

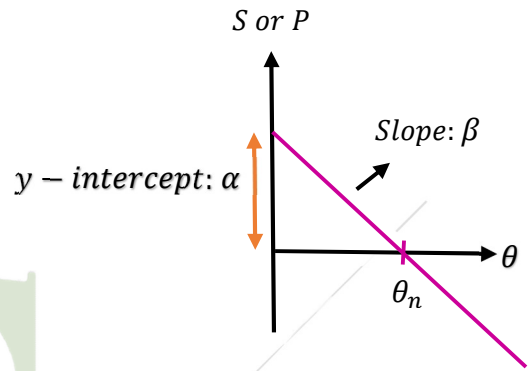
The rate of change of thermo emf with temperature (of hot junction) is called as Seebeck coefficient or thermoelectric power.

i.e.  $S = P = \frac{dE}{d\theta}$ ,

we have,  $E = \alpha\theta + \frac{1}{2}\beta\theta^2$

Therefore,  $S = P = \frac{dE}{d\theta} = \alpha + \beta\theta$

If the graph is plotted between S and  $\theta$ , a straight line with y-intercept ' $\alpha$ ' and slope ' $\beta$ ' is obtained.



- At neutral temperature, the thermoelectric power is zero.
- Thermoelectric power is independent of temperature of cold junction

### Peltier Effect:

When an electric current is passed through a thermocouple, heat is either evolved or absorbed at the junction, depending upon the direction of flow of current. This effect is called Peltier effect. If the direction of current is reversed, the evolution or absorption of heat at the junctions are interchanged.

The Peltier effect is a reversible process.

This effect is the reverse (complementary) process of Seebeck effect.

#### Comparison between Seebeck Effect and Peltier's Effect

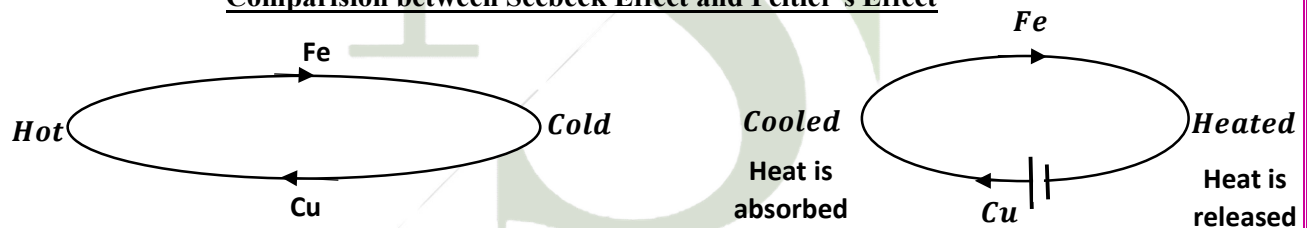


Fig (a): See-beck effect

Fig (b): Peltier's effect

**NB:** Peltier's effect may be used as refrigerator.

1. A thermocouple has a cold junction at  $0^\circ\text{C}$  and when the hot junction is at  $\theta^\circ\text{C}$ , the thermo emf is given by  $E = (20\theta + 0.02\theta^2)\mu\text{V}$ . What is the temperature of hot junction if the thermo emf produced is  $7.5\text{mV}$ ? [290°C]
2. a. What is thermo electric effect? On what factor does thermo emf depend? [2]  
 b. What is seebeck effect? Explain the variation of thermos emf with temperature of hot junction with necessary graph. [3]  
 c. What is Peltier's effect? How is Peltier effect different from Seebeck effect? [2]  
 d. What is thermocouple? Describe the construction and working of thermocouple. [2]  
 e. A thermocouple has its cold junction at  $0^\circ\text{C}$  and the emf decreases to zero when the temperature of hot junction is  $540^\circ\text{C}$ . What would be the temperature of inversion if cold junction is at  $30^\circ\text{C}$ ? [510°C]
3. The thermoemf satisfy the relation:  $E = a\theta + b\theta^2$ . Where,  $a = 4.2\mu\text{VC}^{-1}$  and  $b = -0.0035\mu\text{VC}^{-2}$ . Calculate the neutral temperature and temperature of inversion. [600°C and 1180°C] [3]