

Chapter: Thermoelectric Effect

- Define and understand the cause of Seebeck effect and Peltier effect
- Thermocouple, thermoelectric series
- Variation of thermo-emf with temperature of hot junction
- Application of thermoelectric effect: Thermopile

Conversion of thermal energy (Heat) to electricity {and vice-versa}: By Thomas Seebeck (1821)

The Thermoelectric effect comprises three related effects:

1. Seebeck Effect
2. Peltier Effect
3. Thomson Effect

Seebeck Effect (Thermoelectric Effect):

The phenomenon of production of electricity by keeping junctions (contact points) of two different metals at different temperatures is known as *Seebeck Effect or thermoelectric effect*. The emf is known as thermoelectric emf and the current is thermoelectric current.

The Value of thermo-emf depends on:

- Nature of metals used as pair in thermocouple
- Temperature difference of two junctions of the thermocouple

In Seebeck's Effect, if the hot and cold junction of thermocouple are interchanged, the direction of thermoelectric current in the thermocouple is reversed. So, *Seebeck effect is a reversible process*.

Thermocouples:

A couple (pair) of wires of dissimilar metals which form a loop to produce thermo emf (Thermo-electricity) is called as thermocouples.

Fig: *Fe – cu Thermocouple*

In iron- copper thermocouple, current flows from Cu to Fe at Hot Junction.

(Remember Hot Coffee [At hot junction Cu to Fe])

Cause of Seebeck Effect:

When two dissimilar metals are brought into contact, the free electrons tend to diffuse from the metal with lower electron affinity to the other with greater electron affinity. Due to diffusion, a potential difference is set up at the junction of two metals. And this potential is called **contact potential**, due to which thermoelectric current flows in the thermocouple.

