PELTIER EFFECT

April Monday 103-263 | 12 WEEK 16

In 1834, Jean C. A. Peltier discovered that if a current be allowed to pass through the junction of two different metals, the heat is either evolved or absorbed at the junctions, i.e, the junction gets either heated or cooled. This effect is known as peltier effect.

Suppose the two junctions of a thermocouple are initially at the same temperature and an electric current is passed through the circuit by using an external battery. It is observed that heat is produced at one junction and is absorbed at the other. Thus, one junction is warmed up and the other is cooled down due to the current through the junctions. It is reverse of the seebeck effect and is called the peltier effect.

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If the direction of the current is reversed, the cooling and warming are also reversed. This means, the junction which was originally warmed up, now cools down and vice-versa. The heat absorbed or liberated at the junction is proportional to the charge passed through the junction. If an amount ΔH of heat is produced or absorbed when a charge ΔQ is passed through the junction, the

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16 WEEK 105-261

Define Peltier emf as

$$\Pi_{AB} = \frac{\Delta H}{\Delta Q} = \frac{\text{Peltier heat}}{\text{charge transfered}}$$

The Peltier effect must not be confused with the Joule's effect. The main differences are:-

Evening

$H_{peltier} \propto i$ $H_{joule} \propto i^2$

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Peltier's effect	Joule's effect.
It is a reversible effect	1. It is an irreversible effect.
2. It takes place only at the junctions.	2. It takes place at all points of the circuit and arises from its resistance.
3. It may be heating or a cooling effect.	3. It is always a heating effect.
4. It is proportional to current only	4. It is proportional to the square of current and to the resistance
5. It depends upon the current direction.	5. It is independent of the sign and direction of current.

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