HEAT CONDUCTIVITY IN THERMOELECTRIC MATERIALS

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Abstract: The production of thermoelectric materials and their efficiency improvement is mainly based on the thermoelectric effect. The thermoelectric effect is the direct conversion of temperature differences into electrical voltage through a thermocouple. Conversely, when a voltage is applied to it, heat flows from one side to the other, creating a temperature difference.

Key words: automotive engineering, electronic device, semiconductors, semiconductor microchips, microcircuits.

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Currently, various energy sources are used to solve energy problems. But the increase of humanity and the development of society on a large scale and the increase of production sectors lead to the ever-increasing demand for energy. Alternative and renewable energy sources are widely used to solve such problems. In particular, the world's leading countries, the USA, China, Canada, Anguilla, Germany, Spain, Turkey, Russia and several developed countries, are leading the way in effective use of solar and wind energy. In this regard, the scientists of the Institute of Advanced Scientific Research of Duyo have been conducting scientific researches in the preparation of energy converters and their implementation, and have been applying methods of increasing the efficiency of new types of energy converters. In particular, scientific research is being conducted on the preparation of thermoelectric materials and their efficiency improvement.

LITERATURE ANALYSIS:

The production of thermoelectric materials and their efficiency improvement is mainly based on the thermoelectric effect. The thermoelectric effect is the direct conversion of temperature differences into electrical voltage through a thermocouple. Conversely, when a voltage is applied to it, heat flows from one side to the other, creating a temperature difference. A temperature gradient applied at the atomic scale causes charge carriers in the material to diffuse from the hot side to the cold side. This effect can be used to generate electricity, measure temperature, or change the temperature of objects. Since the direction of heating and cooling is determined by the polarity of the applied voltage, thermoelectric devices can be used as temperature controllers.

RESEARCH METHOD.

The thermoelectric effect includes three distinct effects: the Seebeck effect, the Peltier effect, and the Thomson effect.

In 1821, the German physicist Thomas Seebeck discovered that when two dissimilar metals (Seebeck used copper and bismuth) wires were joined together at both ends to form a loop (Figure 1).

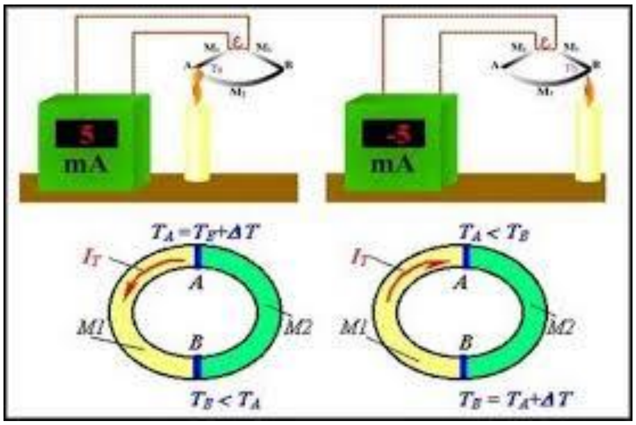

Figure 1. Generation of thermocouples based on the Seebeck effect.

In 1834, French watchmaker Jean Peltier discovered the second thermoelectric effect. Ung's experiment shows that Agar causes heat to be absorbed or released between contacts where two dissimilar metals are joined (Figure 2).

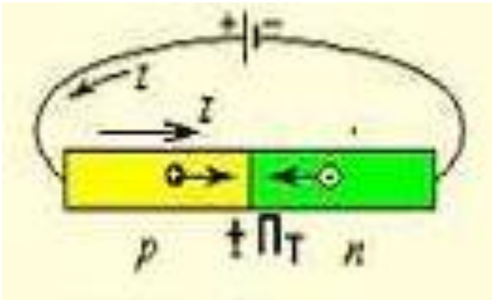

Figure 2. The pillte effect.

William Thomson (later known as Lord Kelvin) discovered a third thermoelectric effect that provides a link between the Seebeck effect and the Peltier effect. When there is a temperature gradient along the current conductor, in addition to the heat released according to the Joule-Lenz law, a certain amount of heat is released or absorbed in the heat circuit (Fig. 3).

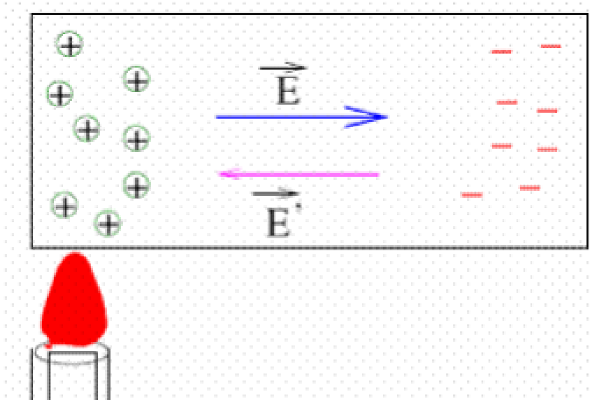

Figure 3. Identifying the Thomson effect.

Taking into account the above effects, the development of efficient thermoelectric devices can increase the enthusiasm of materials research. A heat-to-electricity converter provides an alternative energy supply by improving fuel efficiency and making efficient use of waste heat, thus helping to find new energy solutions. High-quality thermoelectric materials are used to create high-efficiency energy converter devices.

CONCLUSIONS.

A thermoelectric depends on the efficiency of the material to convert heat into electricity. The efficiency of a thermoelectric material is primarily based on the serviceability of the thermoelectric material. Currently, all good thermoelectric materials are semiconductors: they are semiconductors with a lot of free electrons, which have many properties similar to metals. The charge carrier concentration depends on internal defects as well as external additives.

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