Impact Factor: 9.2 ISSN-L: 2544-980X

RESEARCH OF THERMOELECTRIC BRANCHES OF THERMOBATTERY FROM SEMICONDUCTORS

Nurdinova R.A.
Fergana branch of Tashkent University of Information Technologies.

Abstract: *The modern development of engineering and technology constantly confronts scientists with the task of finding new energy sources that would be both efficient and environmentally friendly. For example, in Uzbekistan, the demand for electricity will increase from 2016 to 2023 by 20.4 billion kWh, which requires the development of the latest technologies for creating renewable energy sources.*

Key words: *BiTeSb, PbSe, PbTe.*

INTRODUCTION

The modern development of engineering and technology constantly confronts scientists with the task of finding new energy sources that would be both efficient and environmentally friendly. For example, in Uzbekistan, the demand for electricity will increase from 2016 to 2023 by 20.4 billion kWh, which requires the development of the latest technologies for creating renewable energy sources.

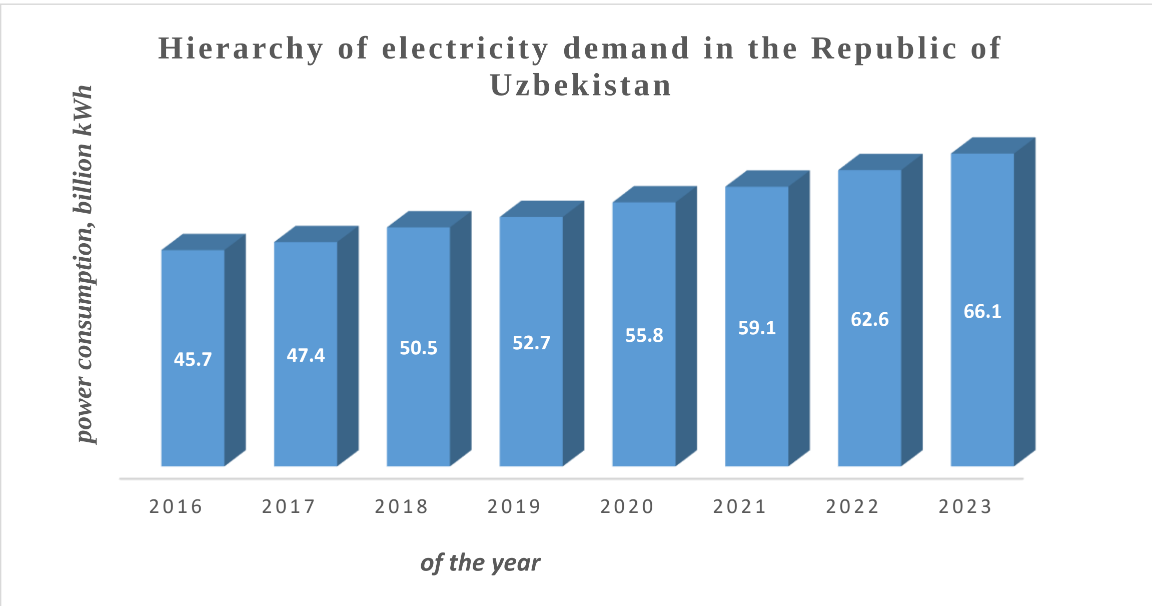

Fig.1. Hierarchy of increasing demand for electricity in Uzbekistan

In this context, thermoelectric devices have attracted increasing attention from researchers and engineers. One of the promising areas in the field of thermoelectricity is the development of thermopile from semiconductor materials.

A thermopile is a device capable of storing thermal energy and converting it into electrical energy. Unlike traditional batteries, which store electrical energy in chemical form, thermopiles allow the direct conversion of heat into electricity, making them more efficient and environmentally friendly.

The use of semiconductor materials in thermopiles has a number of advantages. First, semiconductors have high thermoelectric efficiency, which means they are able to efficiently convert thermal differences into electrical voltage. Second, semiconductors can be easily integrated into a variety of shapes and configurations, making them ideal for creating flexible and compact devices [2].

The development of thermoelectric branches of a thermobattery from semiconductors includes several key technical aspects:

1. **Selection of materials**: One of the key steps is the selection of suitable semiconductor materials with high thermoelectric efficiency. These can be materials such as bismuth telluride (Bi2Te3), lead selenides and tellurides (PbSe, PbTe) and many others. In [2], thermoelectric materials were obtained: BiTeSb (p -type) and BiTeSe (n -type). Due to the size of the branches with a geometric structure, p- and n -type power is formed. The developed thermopile has mechanical strength and a long service life.
2. **Structure optimization**: To achieve maximum efficiency, it is necessary to optimize the structure of the thermopile, including the configuration of semiconductor branches and thermal insulation.

Work [2] provides an analysis of the design and manufacturing technology of radial ring-type fuel cells, where the high-performance method of plasma-arc spraying is used to form barrier and switching layers. A schematic representation of such a device is shown in Fig. 2.

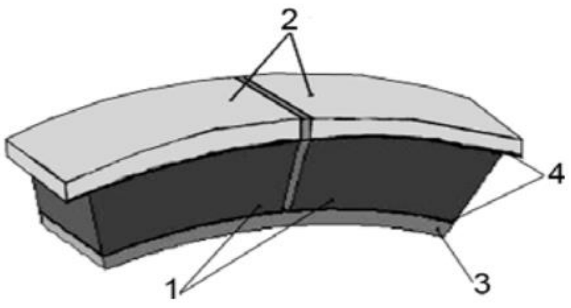

Fig. 2. Radial-ring type thermoelement: 1– semiconductor branches; 2 – external switching covering; 3 – internal switching covering; 4 – barrier layers

The authors of [3] achieved the following results: increased efficiency, mechanical strength and crack resistance of the structure, manufacturability of the structure, increased operating temperature range and environmental friendliness.

3. **Heat Flow Management**: An important aspect is to effectively manage the heat flow in the thermopile to minimize heat loss and maximize conversion to electrical energy. Thermoelectric modules are widely used as heat flux density meters, for measuring and monitoring the thermal conditions of engines, various devices and mechanisms, for determining heat losses, thermal conductivity coefficient, for obtaining information about the nature of heat release of biological objects, for dosimetry, control and automation of technological processes [3].
4. **Integration with other systems**: Thermopiles can be used in a variety of applications, so it is important to ensure their compatibility and integration with other systems, such as solar panels or heat pumps.

The development of thermoelectric branches of a thermobattery from semiconductors opens up new prospects in the field of energy and sustainable development. These devices can find applications in a variety of industries including automotive, industrial manufacturing, home appliances and more.

Future research directions include improving the thermoelectric properties of materials, developing new methods for semiconductor synthesis and processing, and optimizing the design and integration of thermopiles into various systems.

The development of thermoelectric branches of a thermobattery from semiconductors is an important area of research in the field of energy. These devices have great potential for creating efficient and environmentally friendly energy sources, which can significantly affect the future of the energy industry and ensure the sustainable development of the national economy.

References

1. Bulat L.P., Drabkin I.A., Karataev V.V., Osvensky V.B., Pshenay -Severin D.A. Influence of scattering at boundaries on the thermal conductivity of a nanostructured semiconductor material based on the BixSb 2- xTe 3 solid solution // Physics. 2010. T. 52, No. 9. P. 1712-1716.
2. A. M. Kasimaksunova , Maxsudjon Norbutaev , M adinaxon Baratova Thermoelectric generator for rural conditions // Scientific progress. 2021. No. 6. PP 302-308
3. P. Shostakovsky Thermoelectric sources of alternative power supplies, Components and Technologies, No. 12, 2010, pp. 137-137

5. A.V. Simkin, A.V. Biryukov et al. “New design of thermoelectric generator battery: features and advantages” International scientific journal “Alternative Energy and Ecology” No. 10 (114) 2012, pp. 64-68
6. A.M. Kasimakhunova , Sh.A.Olimov , R.Nurdinova , Tahir Iqbal, L.K.Mamadalieva , Highly Efficient Conversion of Solar Energy by the Photoelectric Converter and a Thermoelectric Converter, Journal of Applied Mathematics and Physics, 2018, 6,1-10