

The metallized polyethylene granules as the basis for creating of thermal energy storage system

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Abstract – The possibility of using the technology of metallization of granular polymeric raw materials for the production of an active substance in the development of thermal batteries has been considered. On the example of copper granules of polyethylene, an increase in the efficiency of a thermal battery due to the higher thermal conductivity of the active substance in comparison with non-metallized polyethylene granules has been shown.

Keywords – metallization, granules, polyethylene, energy storage, thermal conductivity.

Introduction

A characteristic feature of the energy sector of Ukraine is the dominant role of nuclear power plants in the production of electric energy. Manoeuvrable power of the nuclear power industry is insignificant and it is used to work in the basic mode. In view of the significant unevenness of daily consumption of electricity, there is a need for implemented of measures that will allow to equalize daily electricity consumption. The One of solutions is the implementation of the "night tariff", and with it the development of systems of electric power supply with the possibility of accumulation of excess heat. A thermal battery (TB), as a system that provides reversible processes for the accumulation, storage and return of thermal energy, can be proposed to optimize the production and consumption of heat energy.

Experimental

To obtain the active substance TB, the technology of metallization of granular polymeric raw material [1] was used, which provided the formation of a solid copper layer on polyethylene granules containing copper content of 3 to 15 wt. %. The research of the laboratory model of TB showed the increase in the maximum temperature that can be achieved on thermocouples placed at a distance of 13 and 25 mm from the surface of the heater. With copper content on PE granules 15 wt. % temperature was 172 and 142 °C, at a heater temperature of 350 °C, which is higher compared to unmetallized PE granules: 155 and 91 °C, respectively.

Conclusion

The obtained preliminary results of the research of the thermal battery model using copper granules polyethylene allow us to assert that they are promising and will be continued in the direction of establishing the optimal metal content as well as the size of the granules.

References

- [1] V.S. Moravskiy, A.M. Kucherenko, I.S. Yakushyk, L. Dulebova, T. Garbach, "Texnologiya metalizatsiyi granulovanoyi polimernoyi syrovyny," *Visnyk NU "Lvivska politexnika": Ximiya, texnologiya rehovyn ta yix zastosuvannya*", vol. 886, pp. 205-212, 2018.