Heating storage materials based on $MgNO_3*6H_2O$

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Subtitle

In this study, the task is to optimize the heating storage composit materials and methods for their preparation based on $MgNO_3*6H_2O$ with minimal supercooling and the absence of phase segregation. The materials have a phase transition in the temperature range from 45 to 75 °C, the heat of the phase transition from 50 to 158 kJ / g, ideal for combine with solar thermal systems.

The Russian government has approved a state program for the development of the Arctic until 2025. More than 2,7 billion euros will be allocated for its implementation. The problem of heat supply in the Arctic is difficult to access for traditional energy sources. The task of heating storage is very important. This is possible using to stable phase change heating storage materials.

Heat storage for space heating and domestic hot water requires efficient heating storage materials with an operating temperature range of 45 to 75 °C, without supercooling, with congruent melting and without phase segregation, stable, non-toxic, affordable and affordable. In this range, a number of crystalline hydrates of inorganic salts have phase transitions, which melt incongruently. The object of the present invention is to eliminate incongruent melting and to minimize phase segregation and supercooling of heating storage materials based on $MgNO_3$

One approach to get rid of incongruent melting is to create eutectic mixtures based on salt crystallohydrates. To minimize the exposure of the nucleating additives that serve as centers of crystallization. For eliminating phase segregation additives thickeners.

To confirm the properties of the synthesized materials by differential scanning calorimetry (DSC) investigated the melting temperature and heat, as well as the value of the temperature hysteresis. Conditions of experiment by DSC method: maximum heating temperature - 130 °C ; minimum cooling temperature - 0 °C; heating rate - 10 °C / min; atmosphere - N_2; cooling rate - 2 °C / min; gas flow rate - 40 ml / min.

The value of supercooling was determined in threefold repetition using the method of temperature history in the conditions of natural cooling of the sample about 10 g of the melted synthesized material.

	$T_{melt.}$, °C	ΔH.,Дж/г	$T_{hysteresis}$.°C	Supercooling
mixture 1	50.49	52.41	Absence	Absence
mixture 2	48.75	76.17	Absence	Absence
mixture 3	71.36	158.7	Absence	Absence
mixture 4	50.99	128.1	Absence	Absence

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