Title: THE MANNER OF PRODUCTION OF COMPOSITE WITH A SANDWICH PANEL STRUCTURE ON THE BASIS OF AEROGEL MAT, POLYURETHANE OR EPOXY RESIN MODIFIED WITH GLYCOLISATE OBTAINED ON THE BASIS OF WASTE POLYETHYLENE TEREPHTHALATE AND ENCAPSULATED PHASE CHANGE MATERIAL (PCM)

Abstract: The manner of production of composite with a sandwich panel structure on the basis of aerogel mat and resin consists in the modification of resin with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM), its hardening and adding encapsulated phase shift material to it. The aerogel mat surface is prepared by applying glass fibre veil soaked with a composition of modified resin with PET glycolisate in the amount of 10 weight %. The composition of modified resin with PET glycolisate is mixed with a glass rod in a glass or polypropylene recipient and it is heated during at least 30 minutes at the temperature of 70-90 degrees C. The hardener in the amount of 10 weight % of resin quantity is added to the modified resin. Encapsulated PCM has the phase shift temperature within the range of 21-25 degrees Celsius and it is bound using modified epoxy or polyurethane resin using the weight ratio of PCM/resin within the range of 0.6-0.7.
The manner of production of composite with a sandwich panel structure on the basis of aerogel mat, polyurethane or epoxy resin modified with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM).

The object of invention is the manner of production of composite with a sandwich panel structure on the basis of aerogel mat, polyurethane or epoxy resin modified with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM).

Composite materials with a sandwich panel structure are well known in current technology. The description of US6467731 presents the capsule destined for the return of astronauts to Earth, the thermal shield of which has been produced from the composite manufactured on the basis of aerogel mat and PCM.

On the other hand, US2008174147 presented a panel with very good insulating properties which was made from the composite, the core of which was made from polyurethane foam, carbon aerogel/ silica and their combinations.

W014198931 presented the insulating composite of aerogel and melamine foam.

The object of the invention is the composite which is capable of retaining the specific shape that has been given to it and characterised by significant thermal and acoustic insulation, as well as the temperature stabilisation properties in a situation of temperature variations within the range exceeding the phase shift temperature of the phase shift material used in the composite.

The manner of production of composite with a sandwich panel structure on the basis of aerogel mat, polyurethane or epoxy resin modified with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM) according to the invention consists in the preparation of aerogel mat surface by means of applying a glass fibre veil soaked with pure resin and an appropriate quantity of hardener to it, and later applying a plastic composition of a given resin with hardener and encapsulated PCM during the resin hardening reaction. Encapsulated PCM is bound using modified epoxy or polyurethane resin at the weight ratio of PCM/resin within the range of 0.6-0.7. Encapsulated PCM has the phase shift temperature within the range of 21-25 degrees Celsius. Epoxy resin
is characterised by greater flexibility thanks to using a modifier in the form of glycolisate obtained on the basis of waste polyethylene terephthalate manufactured using PET waste and polyethylene glycol.

The composite manufactured according to the manner presented in the invention is characterised by high fire resistance thanks to the applied additives. Moreover, the composite is capable of retaining any shape given to it after the hardening, which guarantees geometrical stability of the composite.

The object of the invention is presented in the following example of execution, which does not limit in any way the above-mentioned invention.

Example of execution

The composite mat with a sandwich panel structure on the basis of Spaceloft aerogel mat (manufactured by AspenAerogels) of 5 mm or 10 mm, epoxy resin Epidian 5 modified with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM) is prepared by means of the application of fibre glass veal with the dimensions of 30x30 soaked with the composition consisting of 180 g of modified resin and 20 g of PET glycolisate onto the surface of aerogel mat. Both measured components are mixed with a glass rod in a glass or polypropylene recipient and they are heated during one hour at the temperature of 85 degrees C, which facilitates the reaction between functional groups of substrates. After the composition is cooled to room temperature, hardener amount of 10 weight % of resin quantity is added to the modified resin and they are thoroughly mixed. Then 140 g of encapsulated phase shift material (PCM) is added. Encapsulated PCM (e.g. Micronal (by BASF)) is bound using modified epoxy or polyurethane resin at the weight ratio of PCM/resin within the range of 0.6-0.7, depending on the the manufacturing process of a given composite layer. Encapsulated PCM has the phase shift temperature within the range of 21-25 degrees Celsius. Epoxy resin is characterised by greater flexibility thanks to using a modifier in the form of glycolisate, obtained on the basis of waste polyethylene terephthalate manufactured using PET waste and polyethylene glycol.
This manner can be used in the production of composites retaining the shape given to them, which are characterised by significant thermal insulation capacity and the capability of temperature stabilisation. It can be used for the production of cladding components in the construction sector, elements of window woodwork, the elements of window mobile insulation with heat storage capacity, suspended ceilings, etc. Thanks to thermal and acoustic insulation properties as well as temperature stabilisation capacity it can be used in automotive industry- for the production of cabin elements, soffits, engine shields, etc.
Patent claims

1. The manner of production of composite with a sandwich panel structure on the basis of aerogel mat, polyurethane or epoxy resin modified with glycolisate obtained on the basis of waste polyethylene terephthalate and encapsulated phase change material (PCM) characterised in that the resin is modified with glycolisate obtained on the basis of waste polyethylene terephthalate, after which it is hardened and encapsulated phase change material (PCM) is added to it.

2. The manner according to claim 1 characterised in that the aerogel mat surface is prepared by applying glass fibre veil soaked with a composition of modified resin with PET glycolisate in the amount of 10 weight %.

3. The manner according to claim 1 characterised in that the composition of modified resin with PET glycolisate is mixed with a glass stirrer in a glass or polypropylene recipient and it is heated during at least 30 minutes at the temperature of 70-90 degrees C.

4. The manner according to claim 1 characterised in that the composition of modified resin with PET glycolisate is mixed with a glass stirrer in a glass or polypropylene recipient and it is heated during one hour at the temperature of 85 degrees C.

5. The manner according to claim 1 or 2 characterised in that the hardener in the amount of 10 weight % of resin quantity is added to the modified resin.

6. The manner according to claim 1 or 2 characterised in that encapsulated PCM is bound using modified epoxy or polyurethane resin using the weight ratio of PCM/resin within the range of 0.6-0.7.

7. The manner according to claim 1 or 2 characterised in that the encapsulated PCM has the phase shift temperature within the range of 21-25 degrees Celsius.
A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC:

- INV. C08J5/04
- C08J5/24
- C08J11/04

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

- C08J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>A</td>
<td>US 5 934 099 A (COOK SANFORD L [US] ET AL) 10 August 1999 (1999-08-10) sentence 45, paragraph 4 column 7, line 64</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search: 1 June 2016

Date of mailing of the international search report: 20/06/2016

Name and mailing address of the ISA:
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- Schweissguth, Martin
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