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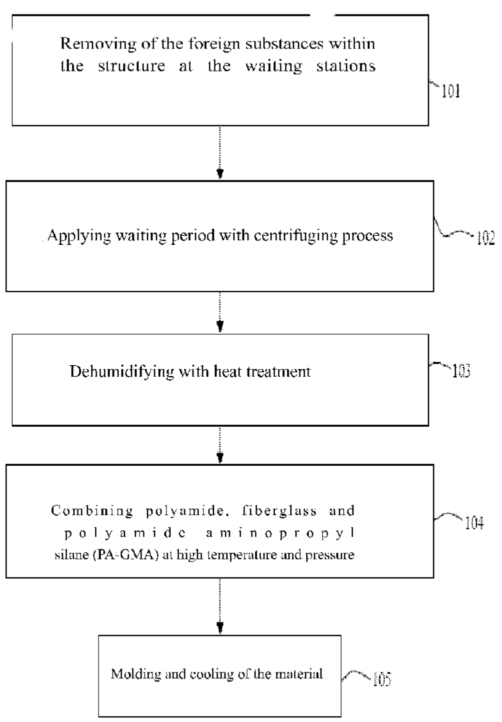
(54) Title: A METHOD FOR PRODUCTION OF A NANO-REINFORCED MATERIAL

Figure-1



(57) Abstract: The present invention relates to a nano-reinforced material with steel and ceramic characteristics by using, in mass ratio, 43 – 50% polyamide, 40 – 42% fiberglass and 10 – 15% polyamide aminopropyl saline (PA-GMA), which functions as a bonder; and the method for production of the said material.

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Description

A METHOD FOR PRODUCTION OF A NANO-REINFORCED MATERIAL

[1] Field of the Invention

[2] The present invention relates to a nano-reinforced material with steel and ceramic characteristics produced by using polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA) and a method for production of the said material.

[3] Prior Art

[4] The International patent application No. WO 2005 054120, one of the applications in the state of the art, discloses a method for production of polymer supported metal particles. However, in the said application, the material produced is heavy due to the fact that metal materials are used and density of metal is high.

[5] Masses of the chemical materials used in the inventive polymer supported material and method for production of the said material are lighter than the materials used in the prior art due to their structure and to the interface process transition employed, and their mechanical properties are improved.

[6] Summary of the Invention

[7] The objective of the present invention is to realize a nano-reinforced material having physical properties similar to steel or ceramics according to preference by using various polymer, fiberglass and nano-combining materials.

[8] Another objective of this invention is to realize a method for production of a nano-reinforced material with the same chemical properties by reduced production costs.

[9] Detailed Description of the Invention

[10] The method for production of a nano-reinforced material realized in order to fulfill the objective of the present invention is illustrated in the accompanying figure, in which;

[11] Figure 1 is a view of the flow chart of the method for production of the inventive nano-reinforced material.

[12] 43 – 50% polyamide, 40 – 42% fiberglass and 10 – 15% polyamide aminopropyl saline (PA-GMA) in mass ratio are used as raw materials for the inventive method for production of a nano-reinforced material. The below described processes are applied to the said raw materials and the inventive nano-reinforced material is obtained as the final product.

[13] 101. Removing of the foreign substances within the structure at the waiting stations

[14] 102. Applying waiting period with centrifuging process

[15] 103. Dehumidifying with heat treatment

[16] 104. Combining polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA) at high temperature and pressure

[17] 105. Molding and cooling of the material

[18] The present invention relates to a new production method recommended for production of a nano-reinforced material by using polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA). For the said materials (polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA)) to be combined safely; water, humidity and similar undesired materials should not be present in their structures and they should be optimally sterilized. For this reason, the said materials should individually wait at the waiting stations at predetermined temperatures and for predetermined periods before production, and are waited depending on the treatment period in order to be freed from the undesired substances present in their structures (101). They are retained stepwise in different stations preferably for 8 to 12 hours at a temperature of 90 to 100°C. In these stations, polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA) are processed by filtered dry and warm air coming from outside. The polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA), which are cleaned from the undesired substances therein in sterilized media, and which will be transferred to the machine where combining process will take place after the determined period expires, are subjected to centrifuging before entering into the machine in order to attain a homogenous structure (102). The mixture, that attains a homogenous structure, enters into the machine where the combining process will be realized. The mixture in the machine is primarily subjected to the heat treatment (103). The purpose here is to bring polyamide and polyamide aminopropyl silane (PA-GMA) that is the nano-combining material, to a viscosity at which they will be able to melt and combine. While polyamide melts at around 300°C, the polyamide aminopropyl silane (PA-GMA) that is used as nano-combining material melts at approximately 280°C. Then, among the elements present in the mixture, firstly the polyamide aminopropyl silane (PA-GMA) that is the nano-combining element melts and later polyamide melts. Since melting temperature of the fiberglass provided in the mixture is approximately 600–650°C, rigidity of the said fiberglass does not deteriorate. After the heat treatment, the polyamide, polyamide aminopropyl silane (PA-GMA) and fiberglass, which are at a viscosity suitable for the combination, are combined at a high temperature (104) and molded and cooled to obtain nano-reinforced material (105).

[19] After being combined under high temperature and pressure (104), the mixture is cooled step by step (105). Here, cooling is realized by gradually reducing temperature values. This is because in order to ensure homogenous orientation within the material, temperature should not be decreased in an instant, but the desired temperature value should be reached by step by step cooling and solidification.

[20] The molds should be at a certain temperature during molding process (105). This temperature value is preferably 80 to 90°C. This is because, if the mold does not have the sufficient temperature, the first material entering the mold will solidify due to temperature difference, therefore the solidified material will block the entrance of the mold; since mold filling and material orientation are realized in a very short period of time, solidification of all the material should be realized at the same instant; for this reason incidence of an orientation failure should be prevented.

[21] The fiber glass used in the inventive method for production of a nano-reinforced material ensures that the modulus of elasticity of the newly formed material is more compared to the polyamide used as polymeric material, whereby it makes the nano-reinforced material more rigid. As a result of the experiments held, modulus of elasticity of the nano-reinforced material realized with the above described production is measured to be approximately 21 GPa. Since modulus of elasticity of aluminum titanate (Al2TiO5) which is known in the art with its ceramic characteristics is known to be 5 to 35 GPa, the nano-reinforced material produced according to the above mentioned method has ceramic characteristics due to 50 – 60% aluminum titanate. Thus, when used in high temperatures the material does not undergo the problems that polyamide does at high temperatures when used alone; the fiberglass within the material acts as a ceramic and eliminates heat. Furthermore, the fact that the fiberglass inserted in the material during production is ensured to be distributed optimally in all directions ensures that the modulus of elasticity are close to each other in all three dimensions; and it is observed that the feature of modulus of elasticity of the nano-reinforced material resulting at the end of the production has increased. Thus, when hydrostatic force is applied to the nano-reinforced material it is aimed that the material exhibits the same behavior in all directions until the flow limit.

[22] In one embodiment of the invention 10 grams of polyamide, 2 grams of fiberglass, and 0.8 – 1 gram of polyamide aminopropyl silane (PA-GMA) are used and a nano-reinforced material is produced in accordance with the above described production method. As a result of the laboratory tests conducted on the produced material, it is determined that the material has a tensile stress of 235 MPa, heat transmission coefficient of 0.38 W/mK and 100kJ energy absorbed at the time of impact.

Claims

[1] A method for production of a nano-reinforced material comprising in mass ratio 43 – 50% polyamide, 40 – 42% fiberglass and 10 – 15% polyamide aminopropyl saline (PA-GMA) which functions as a bonder
and characterized with the steps of
removing of the foreign substances within the structure at the waiting stations (101)
applying waiting period with centrifuging process (102)
dehumidifying with heat treatment (103)
combining polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA) at high temperature and pressure (104)
molding and cooling of the obtained material (105)

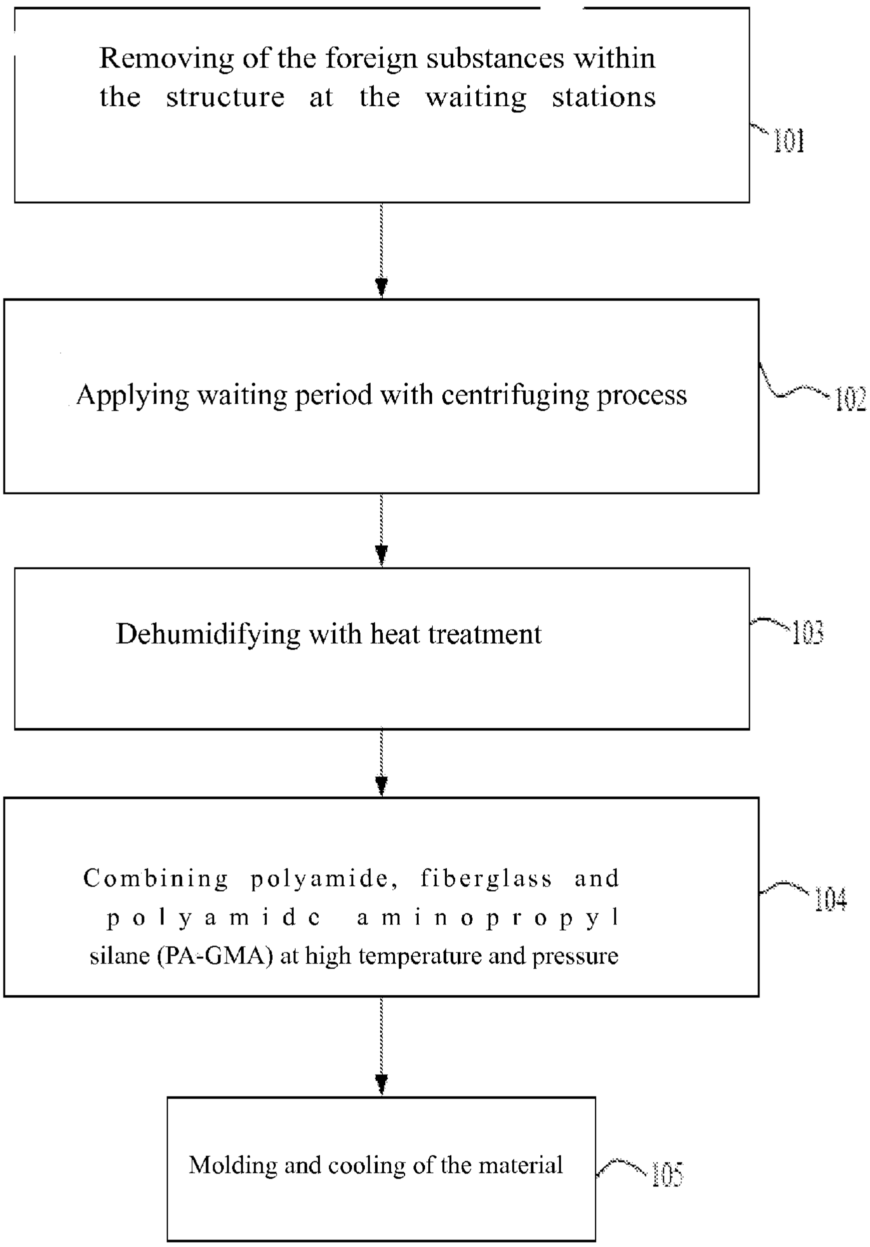
[2] A method for production of a nano-reinforced material according to Claim 1, characterized in that the medium temperature during heat treatment (103) is 290 - 305°C.

[3] A method for production of a nano-reinforced material according to Claim 1 characterized in that temperature of the molds used in molding (105) is 80 - 90°C in order to prevent the material from solidifying in an instant.

[4] A method for production of a nano-reinforced material according to Claim 1 characterized in that the cooling process (105) is realized step by step.

[5] A method for production of a nano-reinforced material according to Claim 1 characterized in that dry and hot air is sent to the polyamide, fiberglass and polyamide aminopropyl silane at the waiting stations.

Figure-1


Removing of the foreign substances within the structure at the waiting stations
101
Applying waiting period with centrifuging process
102
Dehumidifying with heat treatment
103
Combining polyamide, fiberglass and polyamide aminopropyl silane (PA-GMA) at high temperature and pressure
104
Molding and cooling of the material
105

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. C08J5/08 C08L77/00 C08J5/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C08L C08K C03C C08J

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/047050 A1 (OYAMADA HIROSHI [JP] ET AL) 29 November 2001 (2001-11-29) figure 3 paragraph [0058] - paragraph [0061] paragraph [0064] -----	1-5
A	US 2007/286999 A1 (DIJT JACOB CORNELIS [NL] ET AL) 13 December 2007 (2007-12-13) paragraphs [0032], [0033]; table 4 table 7 claims 9,10,20-22 -----	1-5
A	US 3 498 872 A (STERMAN SAMUEL ET AL) 3 March 1970 (1970-03-03) table 1 claims -----	1-5
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
3 June 2009	10/06/2009

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 240 974 A (LECHNER ULRIKE [DE] ET AL) 31 August 1993 (1993-08-31) claims	1-5
A	DATABASE WPI Week 198745 Thomson Scientific, London, GB; AN 1987-317636 XP002530339 -& JP 62 225548 A (NIPPON GLASS SENI KK) 3 October 1987 (1987-10-03) abstract	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2008/053662

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