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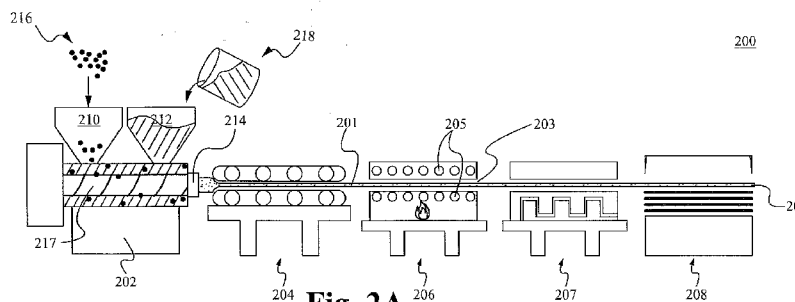


Fig. 2A

(57) Abstract: A method of and an apparatus for making a composite material is provided. The composite is able to be formed by mixing a binder and a physical property enhancing material to form a mixer. The binder is able to be pitch, such as mesophase pitch. The physical property enhancing material is able to be fiber glass. The mixer is able to be processed through a lamination process, stabilization/cross-link process, and carbonization. The composite material is able to be applied in the field of electronic components and green technology, such as a substrate of a photovoltaic cell.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/56480

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - E04D 13/18; E04D 13/17; H02N 6/00 (2012.01)
 USPC - 52/173.3 ; 52/302.1; 52/408; 136/243

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)

IPC(8)- E04D 13/18; E04D 13/17; H02N 6/00 (2012.01);
 USPC- 52/173.3 ; 52/302.1; 52/408; 136/243

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 Patents and NPL (classification, keyword; search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 PubWest (US Pat, PgPub, EPO, JPO), GoogleScholar (PL, NPL), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL);
 Search terms used: pitch, laminate, mesophase, neomesophase, fiberglass, glass, fiber, fibre, coal, ash, mill, quartz, conductive,
 stabilize, stabilise, crosslink, carbonize, carbonise s

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/0151847 A1 (ZHAMU et al.) 18 June 2009 (18.06.2009), para [0034]-[0039], [0049]-[0070], [0074], [0079], [0081], [0087], [0092]	1-8, 10, 11, 13-20
X	US 6,334,895 B1 (BLAND) 01 January 2002 (01.01.2002), Fig. 1; col 4, ln 8-17; col 5, ln 15-40; col 7, ln 50 to col 8, ln 62; col 9, ln 64 to col 10, ln 6; col 12, ln 4-8; col 15, ln 61 to col 16, ln 24; col 17, ln 1-6; col 18, ln 10-19	1, 2, 9
X	WO 2001/02632 A1 (APPLEYARD et al.) 11 January 2001 (11.01.2001), pg 8, para 2; pg 15, para 3-5; pg 16, para 6	10, 11, 14, 15, 17
X	US 4,923,648 A (HARA et al.) 08 May 1990 (08.05.1990), col 1, ln 49-68; col 3, ln 21-25; col 4, ln 22-32; col 4, ln 66 to col 5, ln 7; col 6, ln 19-25	10-12
X	US 2010/0065389 A1 (GILBOY et al.) 18 March 2010 (18.03.2010), para [0013], [0036], [0043], [0067], [0073]-[0075]	18-20

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/56480

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-9 directed to a method of manufacturing a composite material comprising
a) selecting a first material to be added based on a selected material property of the composite material;
b) coupling the first material with a binder material to form a mixture; and
c) stabilizing or cross-linking the binder material, such that the composite material is formed.

Group II: claims 10-17 directed to a composite material comprising a laminate formed by pitch and a material property enhancing material.

-- Please see Extra Sheet --

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/56480

Continued from Box No. III, Observations where unity of invention is lacking:

Group III: claims 18-20 directed to a method of forming a composite material comprising

- a) combining a fiber glass material with a binder material to form a mixture;
- b) laminating the mixture to form a laminate;
- c) stabilizing or cross-linking the binder material at a first temperature; and
- d) carbonizing the laminate at a second temperature.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

Groups I and II do not include the fiber glass material nor the carbonizing the laminate at a second temperature. Of group III.

Groups I and III do not include the pitch and a material property enhancing material of group II.

Groups II and III do not include the selecting a first material to be added based on a selected material property of the composite material of group I.

The common feature of groups I, II and III of a composite material comprising a laminate is taught by US 2005/0049565 A1 to Joseph et al. (para [0015]). The common feature of groups I and III of mixing material with a binder and crosslinking the binder is also taught by Joseph (para [0015]; [0063]); therefore the common feature is not an improvement over the prior art.

None of these technical features are common to the other groups, nor do they correspond to a special technical feature in the other groups. Therefore, unity of invention is lacking.