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3 March 2016

(54) Title: POROUS MATERIALS COMPRISING TWO-DIMENSIONAL NANOMATERIALS

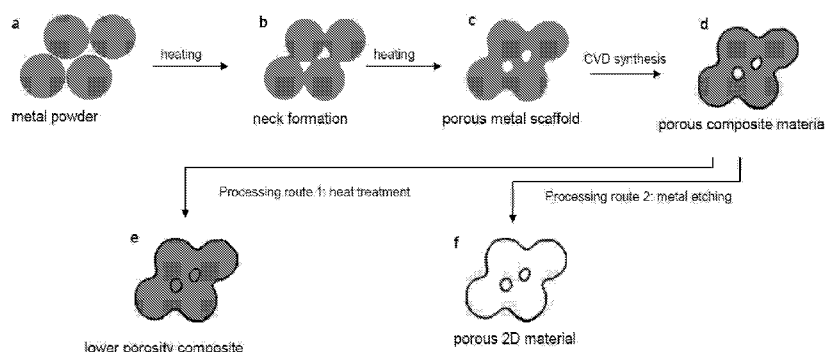


Fig. 1

(57) **Abstract:** According to the present invention, there are provided processes for preparing a porous composite material comprising a metal and a two-dimensional nanomaterial. In one aspect, the processes comprise the steps of: providing a powder comprising metal particles; heating the powder such that the metal particles fuse to form a porous scaffold; and forming a two-dimensional nanomaterial on a surface of the porous scaffold by chemical vapour deposition (CVD). Also provided are materials obtainable by the present processes, and products comprising said materials.

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2015/052225

A. CLASSIFICATION OF SUBJECT MATTER

INV. C23C16/01 C23C16/04 C23C16/26 C01B31/04 C22C1/08
ADD.

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)

C23C C01B C22C C08K

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 practicable, search terms used)

EP0-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	CN 102 786 756 A (SHANGHAI INST CERAMICS) 21 November 2012 (2012-11-21)	33-40
Y	the whole document	2,21,22, 25-30,36

X	CN 103 215 469 A (SHANGHAI INST CERAMICS) 24 July 2013 (2013-07-24)	1,3-15, 17-20, 23,24, 31-35, 37-40
Y	the whole document	2,21,22, 25-30,36

X	WO 2012/144993 A1 (EMPIRE TECHNOLOGY DEV LLC [US]; YAGER THOMAS A [US]) 26 October 2012 (2012-10-26) paragraph [0012]	30-40

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Further documents are listed in the continuation of Box C.



See patent family annex.

* 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

16 October 2015

Date of mailing of the international search report

19/01/2016

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2015/052225

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:

see additional 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 an 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.:

1-13, 15, 17-40(completely); 14(partially)

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/GB2015/052225

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 102 732 037 A (INST METAL RES CHINESE ACAD SC) 17 October 2012 (2012-10-17) the whole document -----	1,30
A	CN 102 675 880 A (UNIV SOUTHEAST) 19 September 2012 (2012-09-19) the whole document -----	1,30
A	US 2013/045385 A1 (KIM WOON CHUN [KR] ET AL) 21 February 2013 (2013-02-21) claim 6 -----	1,30

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2015/052225

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 102786756 A	21-11-2012	NONE	
CN 103215469 A	24-07-2013	NONE	
WO 2012144993 A1	26-10-2012	US 2013021718 A1 WO 2012144993 A1	24-01-2013 26-10-2012
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US 2013045385 A1	21-02-2013	JP 2013040403 A KR 20130019196 A US 2013045385 A1	28-02-2013 26-02-2013 21-02-2013

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13, 15, 17-40(completely); 14(partially)

Process for preparing a porous composite material comprising a metal and a two-dimensiponal nanomaterial including graphene

2. claims: 16(completely); 14(partially)

Process for preparing a porous composite material comprising a metal and a two-dimensiponal nanomaterial including boron nitride, transition metal chalcogenide
