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61/517,307 18 April 2011 (18.04.2011) US(71) Applicant (for all designated States except US): TEXAS
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0398 (US).(81) Designated States (unless otherwise indicated, for every
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CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
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MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
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UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU,
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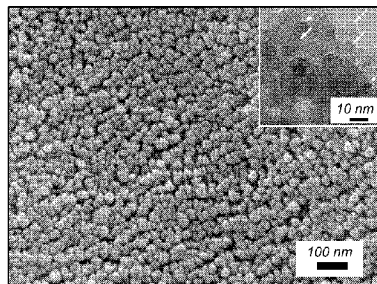
(54) Title: SILICA NANOAGGREGATES AND ORGANOSILICON COMPLEXES AND METHODS OF FORMING THEM
FROM BIOMASS MATERIALS

FIG. 1A

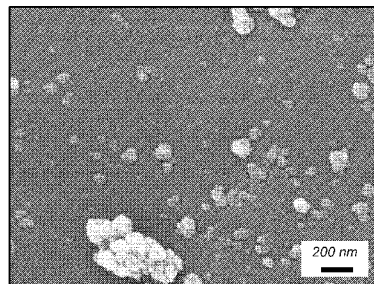


FIG. 1B

(57) Abstract: By controlling the pre-treatment of biomass materials and pyrolysis conditions, silica samples with various surface areas and levels of crystallinity were synthesized. With proper treatment, biogenic silica nanoaggregate (25-30 nm in diameter) can be synthesized from biomass materials. The characterizations revealed that the silica nanoaggregates were composed of smaller primary silica nanoparticles (ca. 4.2 nm in diameter). Under controlled melting catalyzed by metal salt cations, the silica nanoaggregates may be fuse to form semi-crystalline porous silica frameworks with tunable pore size and structural integrity. Organosilicon complexes were synthesized from the bio derived silica nanoaggregates.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/026891**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.: 12, 15, 20
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:

Claims 12, 15 and 20 refer to claims 11, 14 and 19, respectively. However, claims 11, 14 and 19 do not comply with PCT Rule 6.4(a), and thus they are not searchable, nor are their dependent claims 12, 15 and 20.

3. ☒ Claims Nos.: 4-7, 11, 13, 14, 16, 19, 21, 22
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:

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 fee, this Authority did not invite payment of any additional fee.
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.

A. CLASSIFICATION OF SUBJECT MATTER*C01B 33/12(2006.01)i, B82B 1/00(2006.01)i, B82B 3/00(2006.01)i*

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)

C01B 33/12; C01B 33/157; A62D 3/33; C08K 9/00; A61K 33/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: silica, nanoaggregate, biomass, rice husk, acid, heating, particle size, diameter, porous

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0061910 A1 (KATSUYOSHI KONDOH et al.) 11 March 2010 See abstract, claims 1, 5-7	1-3, 8-10, 17-18
A	US 2008-0286383 A1 (GARRY ROBERT NUNN) 20 November 2008 See abstract, claims 28-29	1-3, 8-10, 17-18
A	US 2003-0096900 A1 (BRIAN DAVID HOLDEN) 22 May 2003 See abstract, claim 1	1-3, 8-10, 17-18
A	US 2007-0276051 A1 (HAMDAN HALIMATON) 29 November 2007 See abstract, claims 1-3	1-3, 8-10, 17-18
PX	ACS APPL. MATER. INTERFACES, 2012, 4, 977-981 (WEIXING WANG et al.) 29 December 2011 See the whole document	1-3, 8-10, 17-18



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"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 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

29 NOVEMBER 2012 (29.11.2012)

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City, 302-701, Republic of Korea

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/026891

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0061910 A1	11.03.2010	CN 101528601 A JP W020-080537 11A1 US 7998448 B2 WO 2008-053711 A1	09.09.2009 08.05.2008 16.08.2011 08.05.2008
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