



- (51) International Patent Classification:
C08G 8/20 (2006.01)
- (21) International Application Number:
PCT/US2014/035195
- (22) International Filing Date:
23 April 2014 (23.04.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/815,401 24 April 2013 (24.04.2013) US
14/260,142 23 April 2014 (23.04.2014) US
14/259,884 23 April 2014 (23.04.2014) US

(71) Applicant (for all designated States except AL, AT, BA, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR): **HEXION INC.** [US/US]; 180 East Broad Street, Columbus, OH 43215 (US).

(71) Applicant (for AL, AT, BA, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR only): **HEXION RESEARCH BELGIUM S.A.** [BE/BE]; Avenue Jean Monnet 1, Ottignies, B-1348 Louvain-la-neuve (BE).

(72) Inventors: **ARBUCKLE, Stephen, W.**; Momentive Specialty Chemicals Inc, 610 Campground Road, Louisville, KY 40216 (US). **BADINI, Gabriele**; Momentive Specialty

Chemicals GmbH, Gennaer Strasse 2-4, 58642 Iserlohn (DE). **HUGGINS, John**; Momentive Specialty Chemicals GmbH, Chempark Building V7, 51368 Leverkusen (DE). **GANGAL, Sanjay**; Momentive Specialty Chemicals Inc, 610 Campground Road, Louisville, KY 40216 (US).

(74) Agent: **JONES, Lisa, Kimes**; Hexions Inc., Associate General Counsel, Intellectual Property, 12650 Directors Drive, Suite 100, Stafford, TX 77477 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, 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, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

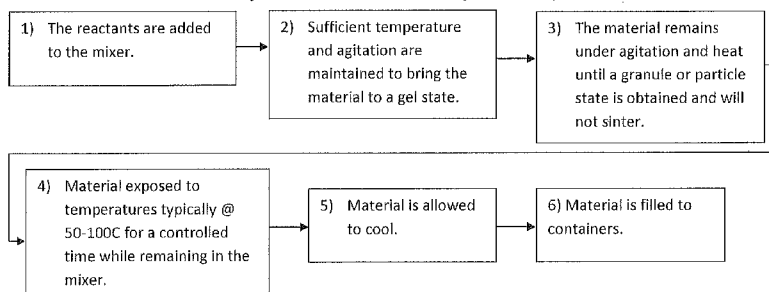
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD FOR PREPARING A SOL-GEL RESIN

Fig. 3 Invention

The exotherm is minimized by addition of the formaldehyde over a period of time.



(57) Abstract: Disclosed are processes for preparing sol-gel resins from phenolic compounds and aldehydes. The process includes reacting an hydroxylated benzene and a catalyst with an aldehyde to form a liquid storage stable intermediate. The storage stable intermediate may then be stored for a period of time before being utilized in a process to prepare the sol-gel resin, in either monolith or particle form, by subsequently reacting the intermediate with an hydroxylated benzene and a catalyst.

WO 2014/176367 A3

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

(88) Date of publication of the international search report:

19 November 2015

Published:

- *with international search report (Art. 21(3))*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/035195

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C08G 8/20 (2014.01) USPC - 524/594 According to International Patent Classification (IPC) or to both national classification and IPC</p>																										
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) IPC(8) - C08G 8/04, 8/10, 8/20 (2014.01) USPC - 521/35, 181; 524/594</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - C08G 8/08, 8/20, 8/22 (2014.06)</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patents, Google Scholar, Google</p>																										
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>US 4,061,620 A (GILLERN) 06 December 1977 (06.12.1977) entire document</td> <td>1-4, 6, 7, 10-18, 20, 21, 24-26</td> </tr> <tr> <td>Y</td> <td>US 2011/0303880 A1 (MULIK et al) 15 December 2011 (15.12.2011) entire document</td> <td>1-4, 6, 7, 10-12, 21</td> </tr> <tr> <td>Y</td> <td>US 5,508,341 A (MAYER et al) 16 April 1996 (16.04.1996) entire document</td> <td>11, 13-18, 20, 21, 24-26</td> </tr> <tr> <td>A</td> <td>US 4,373,062 A (BROWN) 08 February 1983 (08.02.1983) entire document</td> <td>1-26</td> </tr> <tr> <td>A</td> <td>US 3,422,068 A (KREIBICH et al) 14 January 1969 (14.01.1969) entire document</td> <td>1-26</td> </tr> <tr> <td>Y, E</td> <td>US 2014/0148560 A1 (QURESHI et al) 29 May 2014 (29.05.2014) entire document</td> <td>1-26</td> </tr> <tr> <td>Y, P</td> <td>US 2013/0209348 A1 (LUDVIK et al) 15 August 2013 (15.08.2013) entire document</td> <td>1-26</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	US 4,061,620 A (GILLERN) 06 December 1977 (06.12.1977) entire document	1-4, 6, 7, 10-18, 20, 21, 24-26	Y	US 2011/0303880 A1 (MULIK et al) 15 December 2011 (15.12.2011) entire document	1-4, 6, 7, 10-12, 21	Y	US 5,508,341 A (MAYER et al) 16 April 1996 (16.04.1996) entire document	11, 13-18, 20, 21, 24-26	A	US 4,373,062 A (BROWN) 08 February 1983 (08.02.1983) entire document	1-26	A	US 3,422,068 A (KREIBICH et al) 14 January 1969 (14.01.1969) entire document	1-26	Y, E	US 2014/0148560 A1 (QURESHI et al) 29 May 2014 (29.05.2014) entire document	1-26	Y, P	US 2013/0209348 A1 (LUDVIK et al) 15 August 2013 (15.08.2013) entire document	1-26
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																								
Y	US 4,061,620 A (GILLERN) 06 December 1977 (06.12.1977) entire document	1-4, 6, 7, 10-18, 20, 21, 24-26																								
Y	US 2011/0303880 A1 (MULIK et al) 15 December 2011 (15.12.2011) entire document	1-4, 6, 7, 10-12, 21																								
Y	US 5,508,341 A (MAYER et al) 16 April 1996 (16.04.1996) entire document	11, 13-18, 20, 21, 24-26																								
A	US 4,373,062 A (BROWN) 08 February 1983 (08.02.1983) entire document	1-26																								
A	US 3,422,068 A (KREIBICH et al) 14 January 1969 (14.01.1969) entire document	1-26																								
Y, E	US 2014/0148560 A1 (QURESHI et al) 29 May 2014 (29.05.2014) entire document	1-26																								
Y, P	US 2013/0209348 A1 (LUDVIK et al) 15 August 2013 (15.08.2013) entire document	1-26																								
<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>																										
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>“A” document defining the general state of the art which is not considered to be of particular relevance</td> <td>“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</td> </tr> <tr> <td>“E” earlier application or patent but published on or after the international filing date</td> <td>“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</td> </tr> <tr> <td>“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)</td> <td>“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</td> </tr> <tr> <td>“O” document referring to an oral disclosure, use, exhibition or other means</td> <td>“&” document member of the same patent family</td> </tr> <tr> <td>“P” document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			“A” document defining the general state of the art which is not considered to be of particular relevance	“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	“E” earlier application or patent but published on or after the international filing date	“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	“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)	“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	“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family	“P” document published prior to the international filing date but later than the priority date claimed															
“A” document defining the general state of the art which is not considered to be of particular relevance	“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																									
“E” earlier application or patent but published on or after the international filing date	“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																									
“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)	“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																									
“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family																									
“P” document published prior to the international filing date but later than the priority date claimed																										
<p>Date of the actual completion of the international search 11 August 2014</p>		<p>Date of mailing of the international search report 02 SEP 2015</p>																								
<p>Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201</p>		<p>Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p>																								