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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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.

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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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

10 January 2013

(54) Title: FLAME RETARDANT POLYLACTIC ACID COMPOUNDS

(57) Abstract: A significant disadvantage of the use of polylactic acid (PLA), lack of flame retardance, has been overcome by the use of polyphosphonate-co-carbonate in combination with an impact modifier, a drip suppressant, and optionally, an epoxy functional styrene-acrylate oligomeric chain extender. The compound achieves a UL 94 rating of V-0 or V-1 and a Notched Izod value of more than about 5 ft-lbs/in. The compound also exceeds a threshold of 100C in heat deflection temperature.



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A. CLASSIFICATION OF SUBJECT MATTER*C08L 67/04(2006.01)i, C08L 85/02(2006.01)i, C08L 69/00(2006.01)i, C08G 79/02(2006.01)i, C09K 21/14(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)

C08L 67/04; C08L 101/16; C08J 3/20; C08G 64/00; C08G 63/02; C08K 5/3492

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: heat resistance, flame retardant, polylactic acid, polyphosphonate-co-carbonate, impact modifier, drip suppressant, extender

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-144084 A (UNITIKA LTD.) 01 July 2010 See abstract; paragraphs [0009], [0018], [0028], [0029], [0043], [0044]; claims 1-3.	1-5
Y	US 2009-0043013 A1 (STAHL, GAD et al.) 12 February 2009 See paragraphs [0012], [0026]; claim 11.	1-5
Y	JP 2011-057803 A (UNITIKA LTD.) 24 March 2011 See abstract; paragraphs [0047], [0048], [0053].	1-5
Y	US 7645850 B2 (FREITAG, DIETER) 12 January 2010 See abstract; column 1, line 65-column 2, line 8.	1-5



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 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

30 OCTOBER 2012 (30.10.2012)

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31 OCTOBER 2012 (31.10.2012)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/033296**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, 14, 16
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, 14 and 16 refer to the multiple dependent claims which are not drafted in accordance with the third sentence of PCT Rule 6.4(a). Therefore, these claims do not meet the requirements of PCT Article 6 in that the matter for which protection is sought is not clearly defined.
3. ☒ Claims Nos.: 6-11, 13, 15
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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/033296

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2010-144084 A	01.07.2010	None	
US 2009-0043013 A1	12.02.2009	CN 101802063 A EP 2173801 A1 JP 2010-533777 A KR 10-2010-0058480 A WO 2009-012286 A1	11.08.2010 14.04.2010 28.10.2010 03.06.2010 22.01.2009
JP 2011-057803 A	24.03.2011	None	
US 7645850 B2	12.01.2010	CN 101506310 A EP 1919977 A2 EP 1919977 A4 US 2007-0129511 A1 WO 2007-022008 A2 WO 2007-022008 A3	12.08.2009 14.05.2008 09.06.2010 07.06.2007 22.02.2007 30.04.2009