



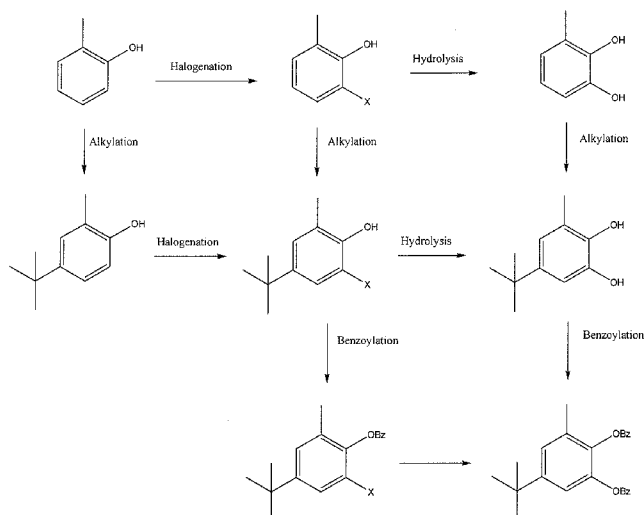
- (51) **International Patent Classification:**
C07C 67/08 (2006.01) *C07C 69/017* (2006.01)
- (21) **International Application Number:**
PCT/US2012/030696
- (22) **International Filing Date:**
27 March 2012 (27.03.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/468,928 29 March 2011 (29.03.2011) US
- (71) **Applicant (for all designated States except US):** **DOW GLOBAL TECHNOLOGIES LLC** [US/US]; 2040 Dow Center, Midland, MI 48674 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **CHEN, Linfeng** [US/US]; 4015 Tuscan Shores Drive, Missouri City, TX 77459 (US). **LEUNG, Tak W.** [US/US]; 3823 Canary Grass Lane, Houston, TX 77059 (US). **GAO, Kuanqiang** [CN/US]; 3205 Princess Bat Court, Pearland, TX 77584 (US). **TAO, Tao** [CN/US]; 1721 Potomac Drive C, Houston, TX 77057 (US).
- (74) **Agent:** **BARTHEL, Ted J.**; Whyte Hirschboeck Dudek S.C., 555 East Wells Street, Suite 1900, Milwaukee, WI 53202 (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, 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, IS, JP, KE, KG, KM, 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, 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.
- (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, MD, 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, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) **Title:** PRODUCTION OF SUBSTITUTED PHENYLENE AROMATIC DIESTERS

FIG. 1

Reaction Scheme 1
Reaction Pathways for Synthesizing BMC/BMPD from *o*-Cresol as Starting Material



x = Halogen

(57) **Abstract:** Synthesis pathways for a precursor to 5-tert-butyl-3-methyl-1, 2-phenylene dibenzoate are provided. The precursor is methylcatechol and/or 5-tert-butyl-3-methylcatechol.

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

27 December 2012

- *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))*

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/030696

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07C67/08 C07C69/017
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)
C07C

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)

EPO-Internal, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2010/078512 A2 (DOW GLOBAL TECHNOLOGIES INC [US]; LEUNG TAK W [US]; ROTH GARY A [US];) 8 July 2010 (2010-07-08) claims 1-10; paragr. [0025]-[0042], [0054]; examples 1-6	1-4
Y	----- H.A.IDDLES ET AL.,: "Rearrangement of the Triphenylmethyl Ethers of Ortho Cresol and Brominated Ortho Cresols", JOURNAL OF THE AMERICAN CHEMICAL SOCIETY,, vol. 62, no. 1, 1940, pages 71-73, XP002680291, page 71, reaction scheme; page 72, left column , lines 25-27 and last paragraph -----	1-4



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

8 October 2012

Date of mailing of the international search report

23/10/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Grammenoudi, S

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/030696

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.:

3, 4
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.

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, 2

A four-step process for the preparation of 5-t-butyl-3-methyl-1,2-phenylene dibenzoate from o-cresol via the intermediates 2-halo-6-methylphenol, 3-methylcatechol and 5-t-butyl-3-methylcatechol.

2. claims: 3, 4

A four-step process for the preparation of 5-t-butyl-3-methyl-1,2-phenylene dibenzoate from o-cresol via the intermediates 2-halo-6-methylphenol, 2-halo-4-t-butyl-6-methylphenol and 5-t-butyl-3-methylcatechol.

3. claims: 5-8

A six-step process for the preparation of 5-t-butyl-3-methyl-1,2-phenylene dibenzoate from o-cresol via the intermediates 1-alkoxy-2-methylbenzene, 1-alkoxy-2-halo-6-methylbenzene, 2-alkoxy-3-methylphenol, 5-t-butyl-1,2-dialkoxy-3-methylbenzene and 5-t-butyl-3-methylcatechol.

4. claims: 9-11

A four-step process for the preparation of 5-t-butyl-3-methyl-1,2-phenylene dibenzoate from catechol via the intermediates 2,3-dihydroxybenzaldehyde, 3-methylcatechol and 5-t-butyl-3-methylcatechol.

5. claims: 12, 13

A two-step process for the preparation of 3-methylcatechol from o-vanilin via the intermediate 2-methoxy-6-methylphenol.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/030696

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010078512 A2	08-07-2010	CN 102333749 A	25-01-2012
		EP 2373604 A2	12-10-2011
		JP 2012514599 A	28-06-2012
		SG 172438 A1	28-07-2011
		US 2010174105 A1	08-07-2010
		WO 2010078512 A2	08-07-2010
