



## (51) International Patent Classification:

C07C 2/86 (2006.01) C07C 7/04 (2006.01)  
C07C 15/067 (2006.01) B01J 8/02 (2006.01)

[US/US]; 10100 Bay Area Blvd, Pasadena, TX 77507 (US). **PODREBARAC, Gary, G.** [CA/US]; 10100 Bay Area Blvd., Pasadena, TX 77507 (US).

## (21) International Application Number:

PCT/US2011/055728

(74) Agents: **BERGMAN, Jeffrey, S.** et al.; Osha - Liang LLP, 909 Fannin Street, Suite 3500, Houston, TX 77010 (US).

## (22) International Filing Date:

11 October 2011 (11.10.2011)

(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.

## (25) Filing Language:

English

## (26) Publication Language:

English

## (30) Priority Data:

61/394,061 18 October 2010 (18.10.2010) US

(71) Applicant (for all designated States except US): **CATALYTIC DISTILLATION TECHNOLOGIES** [US/US]; 10100 Bay Area Blvd, Pasadena, TX 77507 (US).

## (72) Inventors; and

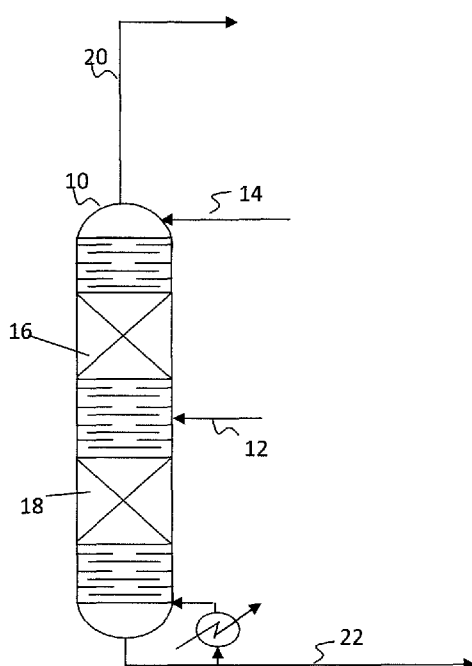
(75) Inventors/Applicants (for US only): **YE, Minghua** [US/US]; 22506 Sierra Lake Ct., Katy, TX 77494 (US). **PHAN, Quoc, T.** [US/US]; 10100 Bay Area Boulevard, Pasadena, TX 77507 (US). **MARASCHINO, Mario, J.**

(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,

[Continued on next page]

## (54) Title: BENZENE ALKYLATION

Figure 1



(57) Abstract: A process for the production of alkylbenzene, the process including: feeding a C1 to C6 alcohol and benzene to a catalytic distillation reactor system comprising an upper reaction zone containing an alkylation catalyst and a lower reaction zone containing a transalkylation catalyst, which may be the same or different than the alkylation catalyst; concurrently in the catalytic distillation reactor system: reacting a portion of the alcohol with the benzene within the upper reaction zone to form a reaction mixture containing water, alkylbenzene, dialkyl ether, unreacted alcohol, unreacted benzene, and polyalkylate including dialkylbenzene; reacting a portion of the polyalkylate with benzene in the lower reaction zone to form additional alkylbenzene; and fractionally distilling the reaction mixture; recovering an overheads fraction from the catalytic distillation reactor system comprising benzene, unreacted alcohol, water, and dialkyl ether; recovering a bottoms fraction from the catalytic distillation reactor system comprising benzene, alkylbenzene, and polyalkylate.



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).

— *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))*

**Published:**

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

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

26 July 2012