

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
15 February 2007 (15.02.2007)

PCT

(10) International Publication Number
WO 2007/018807 A3

(51) International Patent Classification:
C07D 487/22 (2006.01)

(21) International Application Number:
PCT/US2006/025162

(22) International Filing Date: 27 June 2006 (27.06.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/192,934 29 July 2005 (29.07.2005) US

(71) Applicant (for all designated States except US): **NORTH CAROLINA STATE UNIVERSITY** [US/US]; 920 Main Campus Drive, CB 8210, Venture Building II, Suite 400, Raleigh, North Carolina 27606 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LINDSEY, Jonathan, S.** [US/US]; 3931 Napa Valley Drive, Raleigh, North Carolina 27612 (US). **TANIGUCHI, Masahiko** [JP/US]; 2300 Avent Ferry Road, Apartment J-4, Raleigh, North Carolina 27606 (US). **FAN, Dazhong** [CN/US]; 2300 Avent Ferry Road, Apartment I-5, Raleigh, North Carolina 27606 (US).

(74) Agent: **MYERS BIGEL SIBLEY & SAJOVEC, P.A.**;
P.o. Box 37428, Raleigh, North Carolina 27627 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

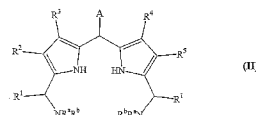
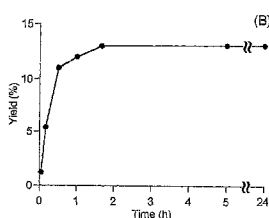
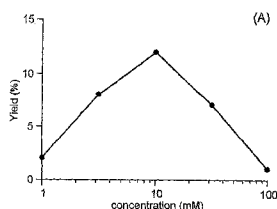
Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
27 September 2007

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHODS AND INTERMEDIATES FOR THE SYNTHESIS OF PORPHYRINS



(57) Abstract: A method of making a porphyrin is carried out by: (a) condensing (i) 1,9-bis(*N,N*-dialkylaminomethyl)dipyromethane of Formula (II); with (ii) a dipyromethane to produce a reaction product; then (b) oxidizing the reaction product; and then (c) optionally demetallating said reaction product to produce the porphyrin. The reaction is particularly useful for making substituted porphyrins with a wide range of substituents at the A and/or B (the 5 and/or 15) positions.

WO 2007/018807 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 06/25162

| <p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C07D 487/22 (2007.01) USPC - 540/145 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) USPC - 540/145</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 540/145, 472 and all relevant classifications (text search, see terms)</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST (USPT, PGPB, EPAB, JPAB); DialogPRO (Engineering); Google Scholar Search Terms: porphyrin, methanol, alcohol, oxidizing agent, zinc, palladium, DDQ, o-chloranil</p> | | | | | | | | | | | |
| <p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Y</td> <td>US 2005/0096465 A1 (Lindsey et al.) 05 May 2005 (05.05.2005), entire document especially Scheme 4-5, para [0042]-[0043] and [0020]</td> <td style="text-align: center;">1-24</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>US 2004/0259810 A1 (Grierson et al.) 23 December 2004 (23.12.2004), entire document especially para [0040]-[0041]</td> <td style="text-align: center;">1-24</td> </tr> </tbody> </table> | | | Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | Y | US 2005/0096465 A1 (Lindsey et al.) 05 May 2005 (05.05.2005), entire document especially Scheme 4-5, para [0042]-[0043] and [0020] | 1-24 | Y | US 2004/0259810 A1 (Grierson et al.) 23 December 2004 (23.12.2004), entire document especially para [0040]-[0041] | 1-24 |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | | | | | | | | | |
| Y | US 2005/0096465 A1 (Lindsey et al.) 05 May 2005 (05.05.2005), entire document especially Scheme 4-5, para [0042]-[0043] and [0020] | 1-24 | | | | | | | | | |
| Y | US 2004/0259810 A1 (Grierson et al.) 23 December 2004 (23.12.2004), entire document especially para [0040]-[0041] | 1-24 | | | | | | | | | |
| <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 style="width: 100%;"> <tr> <td style="width: 50%;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%;"> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p> </td> </tr> </table> | | | <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p> | | | | | | | |
| <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p> | | | | | | | | | | |
| <p>Date of the actual completion of the international search 30 May 2007 (30.05.2007)</p> | | <p>Date of mailing of the international search report 23 JUL 2007</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: Lee W. Young</p> <p>PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p> | | | | | | | | | |