



- (51) **International Patent Classification:**
H01L 21/205 (2006.01) *H01L 21/318* (2006.01)
- (21) **International Application Number:**
PCT/US2012/028253
- (22) **International Filing Date:**
8 March 2012 (08.03.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/451,016 9 March 2011 (09.03.2011) US
13/413,014 6 March 2012 (06.03.2012) US
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- (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).

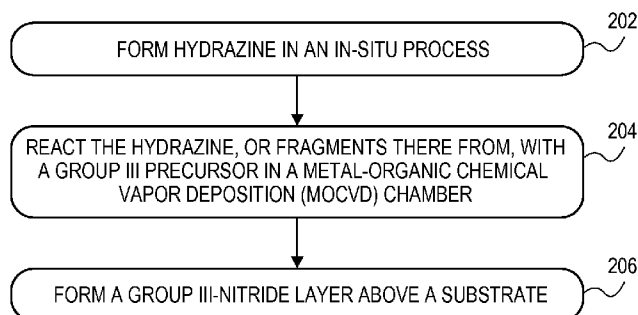
Published:

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

[Continued on next page]

(54) **Title:** MOCVD FABRICATION OF GROUP III-NITRIDE MATERIALS USING IN-SITU GENERATED HYDRAZINE OR FRAGMENTS THERE FROM

FLOWCHART 200

**FIG. 2**

(57) **Abstract:** The metal-organic chemical vapor deposition (MOCVD) fabrication of group III-nitride materials using in-situ generated hydrazine or fragments there from is described. For example, a method of fabricating a group III-nitride material includes forming hydrazine in an in-situ process. The hydrazine, or fragments there from, is reacted with a group III precursor in a metal-organic chemical vapor deposition (MOCVD) chamber. From the reacting, a group III-nitride layer is formed above a substrate.



— *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:
22 November 2012

A. CLASSIFICATION OF SUBJECT MATTER***H01L 21/205(2006.01)i, H01L 21/318(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)

H01L 21/205; B05D 1/36

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: MOCVD,nitride,hydrazine,in-situ,ammonia,hydrogen,nitrogen,catalysis,UV,laser,plasma

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010-0279020 A1 (MELNIK YURIY et al.) 04 November 2010 See abstract; figure 4; paragraphs [0039], [0047]	1-23
Y	JAMES W. MITCHELL et al., Microwave plasma in situ generation of nitride reagents, Materials Letters, June 2006, Vol. 60, Issue 12, pages 1524-1526 See abstract; figure 1; pages 1524-1525	1-23
Y	BALDUR ELIASSON et al., Nonequilibrium volume plasma chemical processing, IE EE Transactions on plasma science, December 1991, Vol. 19, No. 6, pages 1063-1077 See abstract; pages 1074-1075	5,8,10-11,19,21-22
Y	SHIGEYUKI TANAKA et al., Synergistic effects of catalysts and plasmas on the synthesis of ammonia and hydrazine, Plasma chemistry and plasma processing, December 1994, Vol. 14, Issue 4, pages 491-504 See whole document	9,20



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

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"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

26 SEPTEMBER 2012 (26.09.2012)

Date of mailing of the international search report

26 SEPTEMBER 2012 (26.09.2012)

Name and mailing address of the ISA/KR

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189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/028253Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

US 2010-0279020 A1

04.11.2010

CN 102414797 A

11.04.2012

KR 10-2012-0023040 A

12.03.2012

TW 201039381 A

01.11.2010

WO 2010-127156 A2

04.11.2010

WO 2010-127156 A3

24.02.2011

WO 2010-127156 A3

04.11.2010