



- (51) International Patent Classification:
C01B 31/02 (2006.01) **H01L 31/042** (2006.01)
C08G 61/12 (2006.01) **B82B 3/00** (2006.01)
H01L 51/50 (2006.01) **B82Y 40/00** (2011.01)
- (21) International Application Number:
PCT/US2012/035368
- (22) International Filing Date:
27 April 2012 (27.04.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/479,998 28 April 2011 (28.04.2011) 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, RU, TJ,

[Continued on next page]

(54) Title: GRAPHENE NANORIBBONS, METHODS OF MAKING SAME, AND USES THEREOF

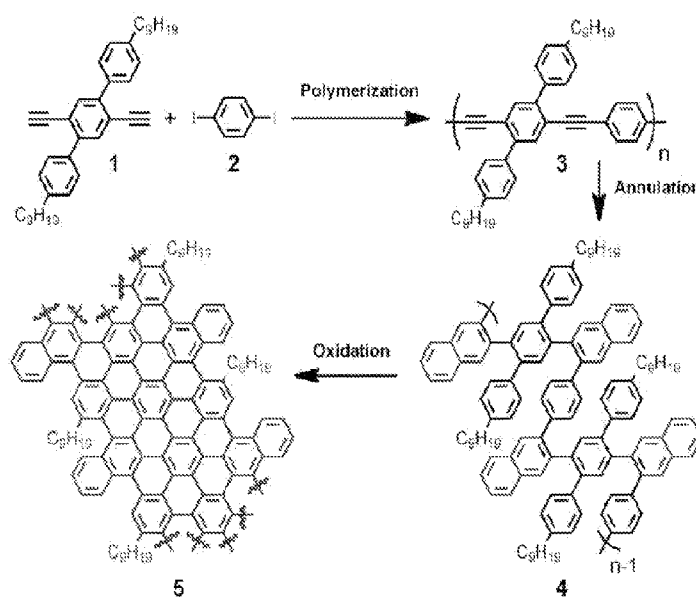


Figure 1

(57) Abstract: Provided are graphene nanoribbons (GNRs), methods of making GNRs, and uses of the GNRs. The methods can provide control over GNR parameters such as, for example, length, width, and edge composition (e.g., edge functional groups). The methods are based on a metal catalyzed cycloaddition reaction at the carbon-carbon triple bonds of a poly(phenylene ethynylene) polymer. The GNRs can be used in devices such as microelectronic devices.



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))*

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

4 April 2013

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/035368**A. CLASSIFICATION OF SUBJECT MATTER*****C01B 31/02(2006.01)i, C08G 61/12(2006.01)i, H01L 51/50(2006.01)i, H01L 31/042(2006.01)i, B82B 3/00(2006.01)i, B82Y 40/00(2011.01)n***

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)

C01B 31/02; C09C 1/44; C08F 301/00; D01F 9/12; B05D 1/04; B32B 9/04; C09K 11/06

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: graphene, nanoribbon, poly(phenylene ethynylene) polymer, annulating compound, catalyst

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	J.AM.CHEM.SOC. 2008, 130, 4216-4217 (XIAOYIN YANG et al.) 07 March 2008 See scheme 1	1-12
A	US 2010-0028681 A1 (HONGJIE DAI et al.) 04 February 2010 See abstract, example 5, claims 7-8	1-12
A	US 2010-0105834 A1 (JAMES M. TOUR et al.) 29 April 2010 See abstract, claim 1	1-12
A	US 2010-0047154 A1 (JAE-KAP LEE et al.) 25 February 2010 See abstract, claim 1	1-12
A	US 7887888 B1 (ANTON N. SIDOROV et al.) 15 February 2011 See abstract, claim 1	1-12



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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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

26 DECEMBER 2012 (26.12.2012)

Date of mailing of the international search report

27 DECEMBER 2012 (27.12.2012)

Name and mailing address of the ISA/KR

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Facsimile No. 82-42-472-7140

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/035368

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0028681 A1	04.02.2010	None	
US 2010-0105834 A1	29.04.2010	CA 2762430 A1 CA 2765492 A1 EP 2327085 A1 EP 2432733 A2 EP 2443062 A1 JP 2012-500179 A KR 10-2011-0050523 A TW 201012749 A WO 2010-022164 A1 WO 2010-022164 A9 WO 2010-096665 A1 WO 2010-147859 A1 WO 2010-147860 A1 WO 2011-016889 A2	10.02.2011 23.12.2010 01.06.2011 28.03.2012 25.04.2012 05.01.2012 13.05.2011 01.04.2010 25.02.2010 17.06.2010 26.08.2010 23.12.2010 23.12.2010 10.02.2011
US 2010-0047154 A1	25.02.2010	KR 10-1040967 B1 KR 10-2010-0023638 A	16.06.2011 04.03.2010
US 7887888 B1	15.02.2011	None	