

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 April 2008 (17.04.2008)

PCT

(10) International Publication Number
WO 2008/046010 A3

(51) International Patent Classification:

C08K 7/06 (2006.01) H01B 1/12 (2006.01)
C08K 7/24 (2006.01) H01B 1/24 (2006.01)
C09D 5/24 (2006.01) H01L 51/00 (2006.01)

(74) Agent: BUESE, Mark, A.; Saliwanchik, Lloyd & Saliwanchik, P.O. Box 142950, Gainesville, FL 32614-2950 (US).

(21) International Application Number:

PCT/US2007/081121

(22) International Filing Date: 11 October 2007 (11.10.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/850,939 11 October 2006 (11.10.2006) US

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): UNIVERSITY OF FLORIDA RESEARCH FOUNDATION, INC. [US/US]; 223 Grinter Hall, Gainesville, FL 32611 (US).

(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, MT, 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).

(72) Inventors; and

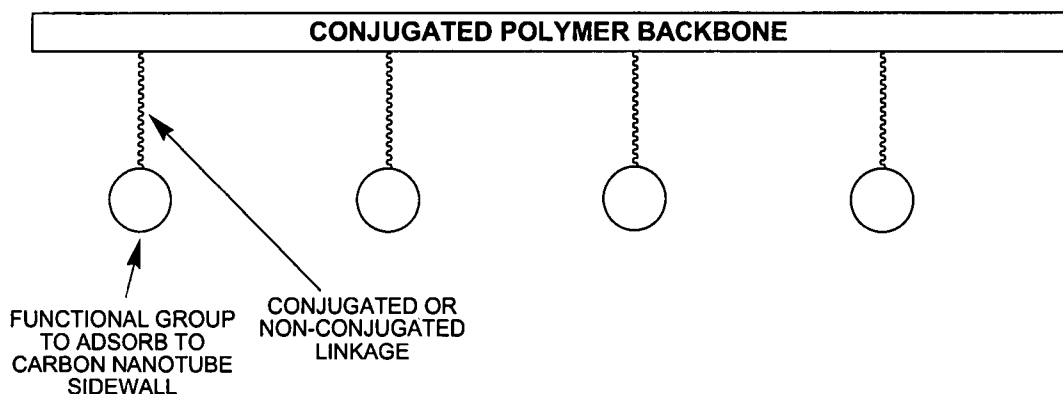
(75) Inventors/Applicants (for US only): REYNOLDS, John, R. [US/US]; 3645 Nw 24th Place, Gainesville, FL 32605 (US). WALCZAK, Ryan, M. [US/US]; 3230 Sw Archer Road #1-257, Gainesville, FL 32608 (US). RINZLER, Andrew, G. [US/US]; 1713 Sw 86th Street, Newberry, FL 32669 (US).

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

[Continued on next page]

(54) Title: ELECTROACTIVE POLYMERS CONTAINING PENDANT PI-INTERACTING/BINDING SUBSTITUENTS, THEIR CARBON NANOTUBE COMPOSITES, AND PROCESSES TO FORM THE SAME



(57) Abstract: A composition of matter comprises a polymer with a fully conjugated backbone or a conjugated block with a plurality of binding groups connected to the backbone by a linking moiety. The binding groups permit a non-covalent binding to a graphitic surface such as a carbon nanotube. A composition of matter where an electroactive polymer with binding groups connected to a conjugated backbone through a linking moiety is bound to carbon nanotubes. Such compositions can be used for a variety of applications using electroactive materials.

WO 2008/046010 A3



(88) Date of publication of the international search report:
26 June 2008

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/081121

A. CLASSIFICATION OF SUBJECT MATTER

INV. C08K7/06 C08K7/24 C09D5/24 H01B1/12 H01B1/24
ADD. H01L51/00

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)
C08K C08L C09D H01B H01L C08G

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 practical, 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.
X	EP 1 359 121 A (ZYVEX CORP [US]) 5 November 2003 (2003-11-05) paragraphs [0035] - [0044], [0051] - [0053]; claims 1-28; figures 1a-4	1,2, 5-13, 16-22
X	WO 2004/106420 A (ZYVEX CORP [US]; CHEN JIAN [US]; RAJAGOPAL RAMASUBRAMANIAM [US]) 9 December 2004 (2004-12-09) paragraphs [0042] - [0049]; examples 1-3	1-22
X	US 2006/045838 A1 (LUCIEN MALENFANT PATRICK R [US] ET AL MALENFANT PATRICK ROLAND LUCIE []) 2 March 2006 (2006-03-02) paragraphs [0032] - [0048]; claims 1,8-16; figures 1,2; examples 1,2	1-22
	-/--	

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 document 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.
- *8* document member of the same patent family

Date of the actual completion of the international search

30 April 2008

Date of mailing of the international search report

19/05/2008

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Meiners, Christian

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/081121

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>LI, JIANFENG; HU, LIANGBING; WANG, LIAN; ZHOU, YANGXIN; GRÜNER, GEORGE; MARKS, TOBIN J.: "Organic Light-Emitting Diodes Having Carbon Nanotube Anodes" NANO LETTERS, vol. 6, no. 11, 3 October 2006 (2006-10-03), pages 2472-2477, XP002478681 ACS, WASHINGTON, DC, US cited in the application abstract figure 2 page 2473, second full paragraph</p>	1,7-10, 12-20, 23,25
X	<p>US 6 458 909 B1 (SPREITZER HUBERT [DE] ET AL) 1 October 2002 (2002-10-01) column 2, line 25 - column 3, line 46; claim 1</p>	1-10,12
X	<p>US 2003/225234 A1 (JAYCOX GARY DELMAR [US] ET AL) 4 December 2003 (2003-12-04) claims 1-3</p>	1-4, 6-10,12
X	<p>RUSSELL DAVID M ET AL: "Efficient light harvesting in a photovoltaic diode composed of a semiconductor conjugated copolymer blend" APPLIED PHYSICS LETTERS, AIP, AMERICAN INSTITUTE OF PHYSICS, MELVILLE, NY, US, vol. 80, no. 12, 25 March 2002 (2002-03-25), pages 2204-2206, XP012030410 ISSN: 0003-6951 abstract figures 1-4</p>	1-13
X	<p>ZHAO ET AL: "Synthesis and properties of pyrene-functionalized polyacetylene. A stable helical polymer emitting fluorescence" POLYMER, ELSEVIER SCIENCE PUBLISHERS B.V, GB, vol. 47, no. 5, 22 February 2006 (2006-02-22), pages 1584-1589, XP005294514 ISSN: 0032-3861 abstract scheme 1</p>	1-5, 7-10,12, 13
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/081121

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WALSH C J ET AL: "HETEROARYL SUBSTITUTED POLYTHIOPHENES: CHEMICAL AND ELECTROCHEMICAL SYNTHESSES AND CHARACTERIZATION OF POLY[3-(9-TRIS(ETHYLENE GLYCOL) MONOMETHYL ETHER)CARBAZOYLTHIOPHENE]"</p> <p>MACROMOLECULES, ACS, WASHINGTON, DC, US, vol. 32, no. 7, 6 April 1999 (1999-04-06), pages 2397-2399, XP000823831 ISSN: 0024-9297 page 2398, last paragraph - page 2399, first paragraph scheme 1</p>	1-13
X	<p>US 2006/054866 A1 (AIT-HADDOU HASSAN [US] ET AL) 16 March 2006 (2006-03-16)</p> <p>paragraphs [0128], [0129]; claim 1; example 3</p>	1-3, 5, 7-10, 12-14, 16-18, 20-22
X	<p>CHUNG S-J ET AL: "IMPROVED-EFFICIENCY LIGHT-EMITTING DIODES PREPARED FROM ORGANIC- SOLUBLE PPV DERIVATIVES WITH PHENYLANTHRACENE AND BRANCHED ALKOXY PENDENTS"</p> <p>ADVANCED MATERIALS, WILEY VCH, WEINHEIM, DE, vol. 10, no. 9, 18 June 1998 (1998-06-18), pages 684-688, XP000774673 ISSN: 0935-9648 scheme 1</p>	1-4, 6-13
X	<p>LIU M S ET AL: "Efficient green-light-emitting diodes from silole-containing copolymers"</p> <p>CHEMISTRY OF MATERIALS, AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 15, 31 July 2003 (2003-07-31), pages 3496-3500, XP002453803 ISSN: 0897-4756 scheme 1</p>	1-3, 7-10, 12, 14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/081121

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 1359121	A	05-11-2003	JP 2004002850 A	08-01-2004
			US 2004034177 A1	19-02-2004
			US 2004266939 A1	30-12-2004
WO 2004106420	A	09-12-2004	CN 1813023 A	02-08-2006
			GB 2421506 A	28-06-2006
			JP 2007516314 T	21-06-2007
			KR 20060028679 A	31-03-2006
			US 2007265379 A1	15-11-2007
			NONE	
US 2006045838	A1	02-03-2006	NONE	
US 6458909	B1	01-10-2002	AT 215104 T	15-04-2002
			CA 2275612 A1	25-06-1998
			CN 1244206 A	09-02-2000
			CN 1654505 A	17-08-2005
			DE 19652261 A1	18-06-1998
			WO 9827136 A1	25-06-1998
			EP 0944663 A1	29-09-1999
			JP 2001509184 T	10-07-2001
			KR 20000057614 A	25-09-2000
			NONE	
US 2003225234	A1	04-12-2003	US 2005124732 A1	09-06-2005
			US 2005131185 A1	16-06-2005
US 2006054866	A1	16-03-2006	NONE	