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9 October 2008

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Previous Correction:
see Notice of 26 June 2008

(54) Title: DOPED CARBON NANOTUBE COMPOSITION AND METHODS OF FORMING THE SAME

(57) Abstract: In this invention, processes which can be used to achieve stable doped carbon nanotubes are disclosed. Preferred CNT structures and morphologies for achieving maximum doping effects are also described. Dopant formulations and methods for achieving doping of a broad distribution of tube types are also described.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION Of SUBJECT MATTER
INV. C01B31/02 C09D5/24 H01B1/04 C03C17/22 C03C17/34

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)
COlB C09D HOlB C03C

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 , INSPEC, COMPENDEX, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category"	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	DETTLAFF-WEGLIKOWSKA URSZULA ET AL: "Effect of SOCl2 treatment on electrical and mechanical properties of single-wall carbon nanotube networks" J. AM. CHEM. SOC; JOURNAL OF THE AMERICAN CHEMICAL SOCIETY APR 13 2005, vol. 127, no. 14, 13 April 2005 (2005-04-13), pages 5125-5131, XP002478097 cited in the application the whole document	1-18
Y		1-8,17

-/-

[X] Further documents are listed in the continuation of Box C

D 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 πτοπτy claιm(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 pnority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

1X- 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

1Y" 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 docu¬ments 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	Date of mailing of the international search report
30 July 2008	11/08/2008
Name and mailing address of the ISA/ European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV Ri|swi|k Tel (+31-70) 340-2040, Tx 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Marucci , Al essandra

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document with indication where appropriate of the relevant passages	Relevant to claim No
Y	SKAKALOVA V ET AL: "Effect of chemical treatment on electrical conductivity, infrared absorption, and Raman spectra of single-walled carbon nanotubes" JOURNAL OF PHYSICAL CHEMISTRY B ACS USA, vol. 109, no. 15, 21 April 2005 (2005-04-21), pages 7174-7181, XP002478098 ISSN: 1089-5647 cited in the application	1-8,17
A	the whole document	42-60
A	SKAKALOVA ET AL: "Electrical and mechanical properties of nanocomposites of single wall carbon nanotubes with PMMA" SYNTHETIC METALS, ELSEVIER SEQUOIA, LAUSANNE, CH, vol. 152, no. 1-3, 20 September 2005 (2005-09-20), pages 349-352, XP005066249 ISSN: 0379-6779 the whole document	1-18, 42-60
A	SKAKALOVA V ET AL: "Gamma-irradiated and functionalized single wall nanotubes" DIAMOND AND RELATED MATERIALS, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, NL, vol. 13, no. 2, February 2004 (2004-02), pages 296-298, XP004492556 ISSN: 0925-9635 the whole document	1-18
P,X	DAIHUA ZHANG ET AL: "Transparent, conductive, and flexible carbon nanotube films and their application in organic light-emitting diodes" NANO LETTERS AMERICAN CHEM. SOC USA, vol. 6, no. 9, July 2006 (2006-07), pages 1880-1886, XP002490070 ISSN: 1530-6984 the whole document	42-44, 46,49,51
X	FERRER-ANGLADA N ET AL: "Synthesis and characterization of carbon nanotube-conducting polymer thin films" DIAMOND AND RELATED MATERIALS, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, NL, vol. 13, no. 2, 1 February 2004 (2004-02-01), pages 256-260, XP004492548 ISSN: 0925-9635 the whole document	42-58,60

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/006138

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additi onal **sheet**

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:

42-60

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCTΛSA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-18

Solid carbon nanotube composition comprising 0.5 wt% S and 0.5 wt % Cl and exhibiting a tangential mode position with a peak maximum between 1593 and 1605 cm-1 in the Raman spectrum.

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2. claims: 19-41

Method for treating carbon nanotubes by contacting them with a doping agent and and further characterized by at least one of the following:
exposing the CNTs to a UV treatment;
introducing defects into the CNTs such that they exhibit a G/D ratio in the range of about 14 to about 22 prior to adding a doping agent;
exposing the CNTs to oxidative plasma treatment prior to or simultaneous with adding the doping agent;
exposing the CNTs to electron beam irradiation prior to or simultaneous with adding the doping agent or using a doping catalyst to catalyze the doping step.
A film prepared thereof.

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3. claims: 42-60

A multi-layer structure comprising a substrate, a storage layer and a doped CNT layer in direct contact with the storage layer. Method for preparing the same.
