

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: GREENER WILLIAM  BOND, SCHOENECK & KING, PLLC 10 BROWN ROAD SUITE 102 ITHACA NY 14850 USA
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Date of mailing (day/month/year) <b>24 MAY 2012 (24.05.2012)</b>
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Applicant's or agent's file reference 606P075AA	<b>FOR FURTHER ACTION</b> See paragraph 2 below
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International application No. <b>PCT/US2011/059722</b>	International filing date (day/month/year) <b>08 NOVEMBER 2011 (08.11.2011)</b>	Priority date(day/month/year) 09 NOVEMBER 2010 (09.11.2010)
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International Patent Classification (IPC) or both national classification and IPC  <i>H01M 4/583(2010.01)i, H01M 4/58(2010.01)i, B82B 3/00(2006.01)i, H01M 4/13(2010.01)i, H01M 10/0525(2010.01)i</i>
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Applicant <b>CORNELL UNIVERSITY et al</b>
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1. This opinion contains indications relating to the following items:
- Box No. I Basis of the opinion
  - Box No. II Priority
  - Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - Box No. IV Lack of unity of invention
  - Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - Box No. VI Certain documents cited
  - Box No. VII Certain defects in the international application
  - Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Date of completion of this opinion 23 MAY 2012 (23.05.2012)	Authorized officer Cho Ki Yun Telephone No.	
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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

**PCT/US2011/059722**

**Box No. 1 Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of :
  - the international application in the language in which it was filed
  - a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:
  - a. a **sequence listing** filed or furnished
    - on paper
    - in electronic form
  - b. time of filing or furnishing
    - contained in the international application as filed.
    - filed together with the international application in electronic form.
    - furnished subsequently to this Authority for the purposes of search.
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

**PCT/US2011/059722**

**Box No. IV Lack of unity of invention**

1.  In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- paid additional fees
  - paid additional fees under protest and, where applicable, the protest fee
  - paid additional fees under protest but the applicable protest fee was not paid
  - not paid additional fees

2.  This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

complied with

not complied with for the following reasons:

Group 1: Claims 1-23 relate to a nanoparticle, comprising 1) a carbon material support, and 2) a sulfur material supported on the carbon material support.

Group 2: Claims 24-34 relate to a nanoparticle, comprising 1) a core comprising a metal oxide material, and 2) a shell layer located upon the core and comprising a sulfur cross-linked polymultiene polymer material.

The inventions listed as groups 1-2 do not relate to a single general inventive concept under PCT Rule 13.1, because, under PCT Rule 13.2 they do not share the same or corresponding technical features.

4. Consequently, this opinion has been established in respect of the following parts of the international application :

all parts.

the parts relating to claims Nos. \_\_\_\_\_

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

**PCT/US2011/059722**

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-34	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-34	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-34	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2007-0237990 A1 (KIM, YOUNG NAM) 11 October 2007

D2: KR 10-2003-0013553 A (LG ELECTRONICS INC.) 15 February 2003

D3: US 6194099 B1 (GERNOV, YORDAN M. et al.) 27 February 2001

D4: JP 2009-196843 A (NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL & TECHNOLOGY)

D5: WO 2009-040553 A2 (NANOCO TECHNOLOGIES LIMITED) 02 April 2009

I. Novelty and Inventive Step

Claims 1-34 relate to 1) a nanoparticle and a method for preparing the nanoparticle, the nanoparticle comprising: a carbon support; and a sulfur material supported on the carbon material support, where a cyclic voltammogram of a lithium-sulfur cell that includes the nanoparticle within a cathode shows a stable reduction peak at about 2.4 volts, or 2) a nanoparticle and a method for preparing the nanoparticle, the nanoparticle comprising: a core comprising a metal oxide material; and a shell layer located upon the core and comprising a sulfur cross-linked polymultiene polymer material coupled with an ion conducting polymer material.

D1-D5 disclose a nanoparticle including carbon.

When the inventions of D1-D5 are compared with those of claims 1-34 of the present application, none of above-mentioned prior art documents describes a nanoparticle and a method for preparing the nanoparticle, the nanoparticle comprising: a sulfur material supported on the carbon material support, where a cyclic voltammogram of a lithium-sulfur cell that includes the nanoparticle within a cathode shows a stable reduction peak at about 2.4 volts, and a shell layer located upon the core and comprising a sulfur cross-linked polymultiene polymer material coupled with an ion conducting polymer material.

Therefore, claims 1-34 meet the requirements of PCT Article 33(2) and 33(3) with respect to novelty and inventive step.

2. Industrial Applicability

Claims 1-34 of the present invention are considered industrially applicable under PCT Article 33(4).