US009680148B2

(12) United States Patent
Moganty et al.

(10) Patent No.: US 9,680,148 B2
(45) Date of Patent: Jun. 13, 2017

(54) **FUNCTIONALIZED CARBONS FOR LITHIUM-SULFUR BATTERIES**

(71) Applicant: **NOHMs Technologies, Inc.**, Rochester, NY (US)

(72) Inventors: **Surya Moganty**, Henrietta, NY (US); **Gabriel Torres**, Rochester, NY (US); **Jonathan Lee**, Rochester, NY (US)

(73) Assignee: **NOHMS Technologies, Inc.**, Rochester, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 237 days.

(21) Appl. No.: **14/516,924**

(22) Filed: **Oct. 17, 2014**

(65) **Prior Publication Data**

US 2015/0155549 A1 Jun. 4, 2015

Related U.S. Application Data

(60) Provisional application No. 61/892,713, filed on Oct. 18, 2013.

(51) **Int. Cl.**

H01M 4/36	(2006.01)
H01M 4/62	(2006.01)
C01B 31/02	(2006.01)
H01M 4/583	(2010.01)
H01M 4/133	(2010.01)
H01M 4/60	(2006.01)
H01M 4/38	(2006.01)
H01M 10/052	(2010.01)
H01M 4/02	(2006.01)

(52) **U.S. Cl.**

CPC ***H01M 4/364*** (2013.01); ***C01B 31/02*** (2013.01); ***H01M 4/133*** (2013.01); ***H01M 4/38*** (2013.01); ***H01M 4/583*** (2013.01); ***H01M 4/60*** (2013.01); ***H01M 4/625*** (2013.01); ***H01M 10/052*** (2013.01); *H01M 2004/028* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0244644 A1* 11/2005 Hampden-Smith .. B01J 31/1625 428/408

2012/0116094 A1* 5/2012 Swager C01B 31/0213 548/256

OTHER PUBLICATIONS

He et al. Adsorption (2012) 18:23-29.*

Wang et al. J. Mater. Chem. A, 2013, 1, 9382.*

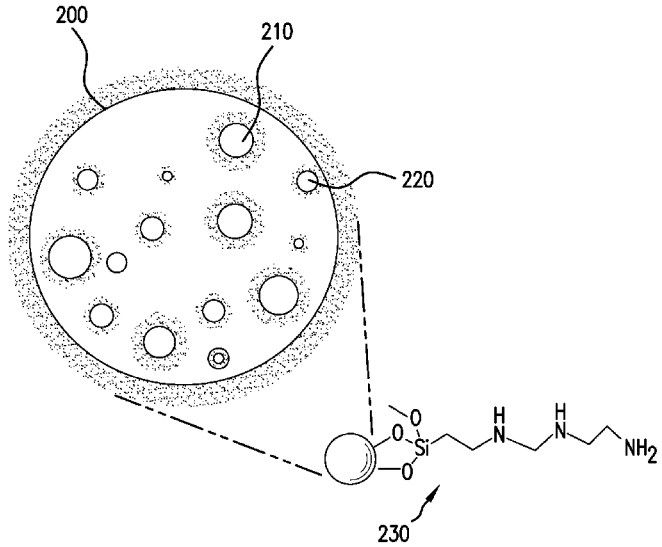
* cited by examiner

Primary Examiner — Sarah A Slifka

Assistant Examiner — Wojciech Haske

(74) *Attorney, Agent, or Firm* — Bond, Schoeneck & King, PLLC; Joseph Noto

(57) **ABSTRACT**

This invention provides for a functionalized porous carbon particle comprising a porous carbon particle linked to a functional group having affinity for a polysulfide, a porous solvent infused carbon particle comprising the porous carbon particle thereof, and a positive electrode comprising the porous carbon particle thereof.

10 Claims, 8 Drawing Sheets