



(51) International Patent Classification:

*C01B 32/15* (2017.01)      *C08L 101/00* (2006.01)  
*C01B 32/18* (2017.01)      *B82Y 30/00* (2011.01)  
*C01B 32/182* (2017.01)     *B82Y 40/00* (2011.01)

(21) International Application Number:

PCT/US2020/022309

(22) International Filing Date:

12 March 2020 (12.03.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/817,309                  12 March 2019 (12.03.2019)      US  
62/817,317                  12 March 2019 (12.03.2019)      US

(71) Applicant: **H QUEST VANGUARD, INC.** [US/US]; 750 William Pitt Way, Pittsburgh, PA 15238 (US).

(72) Inventors: **SKOPTSOV, George L.**; 1444 N. Euclid Avenue, Pittsburgh, PA 15206 (US). **ZELLER, Kurt W.**; 219 Carron Street, Apt. 104, Pittsburgh, PA 15206 (US). **MANTRI, Aayush**; 750 William Pitt Way, Pittsburgh, PA 15238 (US). **VISWANATHAN, Vignesh**; 3531 Beechwood Blvd., Apt 1, Pittsburgh, PA 15217 (US).

(74) Agent: **SINGER, James M.** et al.; Fox Rothschild LLP, 997 Lenox Drive, Lawrenceville, NJ 08648-2311 (US).

(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, 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, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: NANOCARBON MATERIAL AND APPLICATIONS OF NANOCARBON MATERIAL

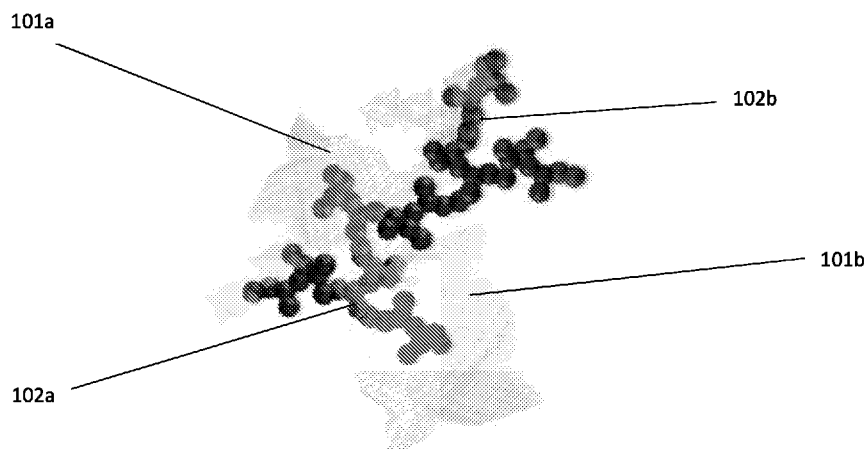


FIG. 1

(57) Abstract: A nanocarbon material includes agglomerate nanostructures made of aggregates of: (i) graphene nanostructures having an at least partially crumpled morphology, and (ii) clusters of at least one carbon material. The carbon material may have a graphitic structure. At least a portion of the graphitic structure may be at least partially hollow and have at least one winged protrusion. Optionally, the nanocarbon material may be part of a composition that includes a dispersion medium or a cementitious material. Methods of making such a composition are also disclosed.



**(88) Date of publication of the international search report:**  
05 November 2020 (05.11.2020)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2020/022309

A. CLASSIFICATION OF SUBJECT MATTER		
<b><i>C01B 32/15 (2017.01)</i></b> <b><i>C01B 32/18 (2017.01)</i></b> <b><i>C01B 32/182 (2017.01)</i></b> <b><i>C08L 101/00 (2006.01)</i></b> <b><i>B82Y 30/00 (2011.01)</i></b> <b><i>B82Y 40/00 (2011.01)</i></b>		
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 32/00-32/991, B82Y 30/00, B82Y 40/00, C08L 101/00-101/16		
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 practicable, search terms used)  PatSearch (RUPTO Internal), USPTO, PAJ, Espacenet, Information Retrieval System of FIPS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/212889 A2 (EDEN INNOVATIONS LLC et al.) 22.11.2018, paragraphs [0007], [0008], [0010], [0012], [0014], [0015], [0017], [0018], [0025], [0028], [0030], [0044]-[0046], [0048], [0061], [0064], [0072], [0074], [0075], table 1	1-12, 14, 15, 22-26, 31-33, 36
Y		13, 16-21, 27-30, 34, 35
Y	WO 2017/095699 A1 (NANOTEK INSTRUMENTS, INC. et al.) 08.06.2017, p. 11, lines 3-10, p. 12, lines 22-27, p. 13, lines 20-27, p. 14, lines 1-8, p. 28, lines 15-20, p. 32, lines 25-28, p. 35, lines 9-22, p. 51, line 20 - p. 52, line 2, examples 1, 9	16-21, 27-30, 34, 35
Y	JP 2006124298 A1 (TOYOTA CENTRAL RES & DEV) 18.05.2016, paragraphs [0020], [0026], [0030]-[0034]	13
A	SG 11201708503V A1 (NGEE ANN POLYTECHNIC) 29.11.2017, abstract, claims	1-36
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> 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 "D" document cited by the applicant in the international application "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 "&" document member of the same patent family		
Date of the actual completion of the international search  22 September 2020 (22.09.2020)		Date of mailing of the international search report  08 October 2020 (08.10.2020)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer  M. Palamarchuk  Telephone No. 8(495)531-64-81