

United
States
of
America



To Promote the Progress



of Science and Useful Arts

The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Katherine Kelly Vidal

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE



US011655521B2

(12) **United States Patent**
Tseng et al.

(10) **Patent No.:** **US 11,655,521 B2**

(45) **Date of Patent:** **May 23, 2023**

(54) **GRAPHENE MODIFYING METHOD OF METAL**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(71) Applicant: **Amazing Cool Technology Corp.**
Taipei (TW)

5,366,688 A * 11/1994 Terpstra H01L 21/4871

2010/0183471 A1* 7/2010 Liu B22F 3/1007

419/36

419/37

(72) Inventors: **Wei-Lin Tseng**, Taipei (TW);
Yang-Ming Shih, Taipei (TW);
Chi-Hang Hung, Taipei (TW)

(Continued)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Amazing Cool Technology Corp.**
Taipei (TW)

CN 104326747 B * 6/2018
CN 106623890 B * 2/2019 B22F 1/0059

OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 147 days.

Chen, Yakun, et al. "Fabrication of in-situ grown graphene reinforced Cu matrix composites." Scientific reports 6.1 (2016): 1-9. (Year: 2016).*

(Continued)

(21) Appl. No.: **16/832,382**

Primary Examiner — Anthony J Zimmer

Assistant Examiner — Sean P. O'Keefe

(74) *Attorney, Agent, or Firm* — Bayramoglu Law Offices LLC

(22) Filed: **Mar. 27, 2020**

(65) **Prior Publication Data**

US 2021/0299746 A1 Sep. 30, 2021

(57) **ABSTRACT**

A graphene modifying method of metal having following steps of providing metal powders, graphene powders and a binder, the metal powder has metal particles, and the graphene powder has graphene micro pieces, each graphene micro piece is formed by 6-atom unit cells connected with each other, each 6-atom unit cell is connected to a stearic acid functional group by a sp³ bond; mixing the metal powder, the graphene powder, and the binder to generate heat by a friction, each sp³ bond connected with the stearic acid functional group is thereby heated and broken, each 6-atom unit cell is connected with other 6-atom unit cells via the broken sp³ bond, and the metal particles are thereby wrapped by the 6-atom unit cells; and sintering the metal particles into a metal body to transform the plurality of graphene micro pieces into a three-dimensional mesh embedded in the metal body.

(51) **Int. Cl.**
B22F 3/10 (2006.01)
B22F 1/142 (2022.01)
(Continued)

(52) **U.S. Cl.**
CPC **C22C 1/05** (2013.01); **B22F 1/103**
(2022.01); **B22F 1/142** (2022.01); **B22F 3/1007** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC **B22F 1/142**; **B22F 3/1007**; **B22F 3/1021**;
B22F 3/225; **B22F 2302/40**

See application file for complete search history.

6 Claims, 4 Drawing Sheets

