

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
20 January 2022 (20.01.2022)



(10) International Publication Number
WO 2022/013317 A1

(51) International Patent Classification:

H01M 8/0206 (2016.01) *H01M 4/86* (2006.01)
H01M 8/0213 (2016.01) *H01M 8/1018* (2016.01)
H01M 8/0228 (2016.01) *H01M 4/88* (2006.01)
H01M 8/124 (2016.01) *H01M 4/96* (2006.01)

(21) International Application Number:

PCT/EP2021/069662

(22) International Filing Date:

14 July 2021 (14.07.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

20185790.1 14 July 2020 (14.07.2020) EP
21179135.5 11 June 2021 (11.06.2021) EP

(71) Applicant (for all designated States except BB, CN):
NANOFILM TECHNOLOGIES INTERNATIONAL LIMITED [SG/SG]; 28 Ayer Rajah Crescent, #02-02/03, Singapore 139959 (SG).

(71) Applicant (for BB only): **SCHLICH LTD** [GB/GB]; 9 St Catherine's Road, Littlehampton BN17 5HS (GB).

(71) Applicant (for CN only): **NANOFILM VACUUM COATING (SHANGHAI) CO., LTD.** [CN/CN]; No. 399, Songhui Road, Quingpu District, Shanghai, 201703 (CN).

(72) Inventors: **SHI, Xu**; Nanofilm Technologies International Ltd, 28 Ayer Rajah Crescent, #02-02/03, Singapore 139959 (SG). **TANG, Zhi**; Nanofilm Technologies International Ltd, 28 Ayer Rajah Crescent, #02-02/03, Singapore 139959 (SG).

(74) Agent: **SCHLICH**; 9 St Catherine's Road, Littlehampton West Sussex BN17 5HS (GB).

(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, IT, 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).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))

(54) Title: CARBON COATED HYDROGEN FUEL CELL BIPOLAR PLATES

(57) Abstract: A bipolar plate for a PEM hydrogen fuel cell is coated with a carbon-containing coating, the carbon-containing coating comprising in order: a) a titanium seed layer; b) a titanium nitride interfacial layer; and c) a a-C top layer, and wherein the bipolar plate is formed from stainless steel. Methods for making such coated plates are described. The a-C has a density of greater than 2.0g/cm³, a molar hydrogen content of 5% or less, an sp² carbon content of 40% to 80% and an sp³ carbon content of 20% to 60%. The coated plates possess good electrical conductivity and are resistant to corrosion.



WO 2022/013317 A1