

Title (en)

HIGH NITROGEN STEEL POWDER AND METHODS OF MAKING THE SAME

Title (de)

STAHLPULVER MIT HOHEM STICKSTOFFANTEIL UND VERFAHREN ZU SEINER HERSTELLUNG

Title (fr)

POUDRE D'ACIER À HAUTE TENEUR EN AZOTE ET PROCÉDÉS DE FABRICATION DE CELLE-CI

Publication

**EP 3930942 A4 20230118 (EN)**

Application

**EP 20763825 A 20200226**

Priority

- US 201962810680 P 20190226
- US 2020019894 W 20200226

Abstract (en)

[origin: WO2020176616A1] Provided are methods and devices for forming high nitrogen steel. The processes include heating a steel precursor to a temperature that transforms the steel into an austenite of FCC wherein the heating is in a nitrogen containing atmosphere. After an optional nitrogen uptake time, the precursor is further heated to a temperature above the  $T_N$  of the steel yet below the melting point of the steel thereby preserving a solid and creating a solid solution of nitrogen. The second temperature is optionally maintained for a nitride conversion time, optionally wherein the nitride conversion time is too short to result in sintering of the steel. The process further includes rapid quenching of the precursor powder to maintain the nitrogen solid solution and prevent nitride formation thereby forming a high nitrogen steel with little to no nitride content and including nitrogen in solid solution.

IPC 8 full level

**B22F 1/142** (2022.01); **B22F 1/145** (2022.01); **B22F 7/00** (2006.01); **C22C 33/02** (2006.01); **C22C 38/12** (2006.01); **B22F 1/052** (2022.01)

CPC (source: EP US)

**B22F 1/142** (2022.01 - EP US); **B22F 1/145** (2022.01 - EP US); **C22C 33/0207** (2013.01 - EP); **C22C 33/0257** (2013.01 - EP US); **C22C 33/0285** (2013.01 - EP); **C22C 38/38** (2013.01 - US); **C23C 8/62** (2013.01 - US); **B22F 1/052** (2022.01 - EP US); **B22F 2301/35** (2013.01 - US); **B22F 2998/10** (2013.01 - EP); **B22F 2999/00** (2013.01 - EP)

Citation (search report)

- [A] EP 0456847 A1 19911121 - BERNEX GMBH [DE]
- [I] SIMMONS J W ET AL: "THE P/M PROCESSING OF HIGH-NITROGEN STAINLESS STEELS", JOM: JOURNAL OF METALS, SPRINGER NEW YORK LLC, UNITED STATES, vol. 48, no. 4, 1 April 1996 (1996-04-01), pages 20 - 23, XP000587561, ISSN: 1047-4838
- [A] WANG TSAI-CHEN ET AL: "Fluidized-Bed Nitridation of Stainless Steel Powder", MATERIALS AND MANUFACTURING PROCESSES., vol. 12, no. 2, 1 March 1997 (1997-03-01), US, pages 275 - 290, XP093006696, ISSN: 1042-6914, DOI: 10.1080/10426919708935141
- [A] J W SIMMONS: "MATERIALS SCIENCE & ENGINEERING A Overview: high-nitrogen alloying of stainless steels", ELSEVIER MATERIALS SCIENCE AND ENGINEERING A207, 1 January 1996 (1996-01-01), pages 169, XP055302525, Retrieved from the Internet <URL:http://www.sciencedirect.com/science/article/pii/0921509395099913/pdf?md5=a4fe609b74c3e5d258d8a58dd01e5673&pid=1-s2.0-0921509395099913-main.pdf> [retrieved on 20221209]
- [A] FEICHTINGER HEINRICH K ET AL: "Investigation of the Nitriding Process of Stainless Steel Powder Determination of Hydrogen in the Foundry View project Metallurgy of High Nitrogen Steels View project", 1 October 1990 (1990-10-01), pages 320 - 325, XP093006692, Retrieved from the Internet <URL:https://www.researchgate.net/profile/Heinrich-Feichtinger/publication/255718795\_Investigation\_of\_the\_Nitriding\_Process\_of\_Stainless\_Steel\_Powder/links/00b7d520a70a7bb790000000/Investigation-of-the-Nitriding-Process-of-Stainless-Steel-Powder.pdf> [retrieved on 20221209]
- See references of WO 2020176616A1

Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

DOCDB simple family (publication)

**WO 2020176616 A1 20200903**; AU 2020228291 A1 20211007; CA 3131528 A1 20200903; CN 113840673 A 20211224; EP 3930942 A1 20220105; EP 3930942 A4 20230118; US 2022134424 A1 20220505

DOCDB simple family (application)

**US 2020019894 W 20200226**; AU 2020228291 A 20200226; CA 3131528 A 20200226; CN 202080031000 A 20200226; EP 20763825 A 20200226; US 202017434273 A 20200226