

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
03 March 2022 (03.03.2022)



(10) International Publication Number
WO 2022/047116 A1

(51) International Patent Classification:

A61K 39/12 (2006.01) *A61P 31/14* (2006.01)
A61P 11/00 (2006.01) *C12N 7/00* (2006.01)
A61P 31/12 (2006.01)

Quad, P. O. Box 20386, Stanford, California 94305-2038 (US).

(21) International Application Number:

PCT/US2021/047885

(22) International Filing Date:

27 August 2021 (27.08.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

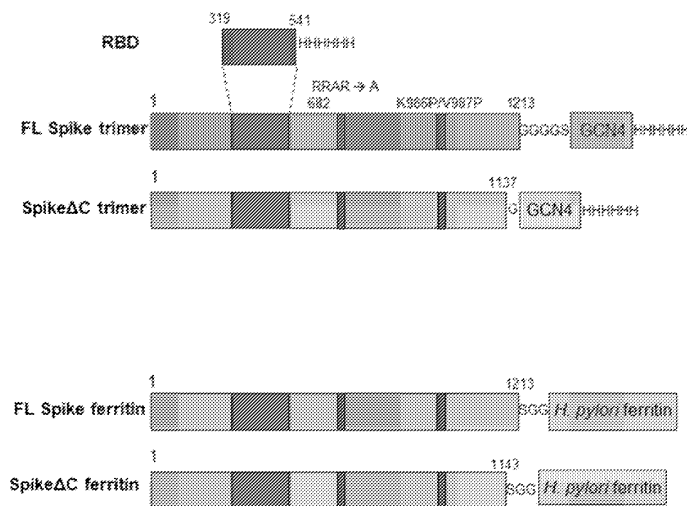
63/070,961 27 August 2020 (27.08.2020) US
63/130,056 23 December 2020 (23.12.2020) US
63/196,837 04 June 2021 (04.06.2021) US

(71) Applicants: **CHAN ZUCKERBERG BIOHUB, INC.** [US/US]; 499 Illinois Street, San Francisco, California 94158 (US). **THE BOARD OF TRUSTEES OF THE LELAND STANFORD JUNIOR UNIVERSITY** [US/US]; Office of the General Counsel, Bldg. 170, Third Floor, Main

(72) Inventors: **POWELL, Abigail E.**; c/o The Board of Trustees of the Leland Stanford Junior University, Office of the General Counsel, Bldg. 170, Third Floor, Main Quad, P.O. Box 20386, Stanford, California 94305-2038 (US). **WEIDENBACHER, Payton Anders**; c/o The Board of Trustees of the Leland Stanford Junior University, Office of the General Counsel, Bldg. 170, Third Floor, Main Quad, P.O. Box 20386, Stanford, California 94305-2038 (US). **FRIEDLAND, Natalia**; c/o The Board of Trustees of the Leland Stanford Junior University, Office of the General Counsel, Bldg. 170, Third Floor, Main Quad, P.O. Box 20386, Stanford, California 94305-2038 (US). **SANYAL, Mrinmoy**; c/o The Board of Trustees of the Leland Stanford Junior University, Office of the General Counsel, Bldg. 170, Third Floor, Main Quad, P.O. Box 20386, Stanford, California 94305-2038 (US). **KIM, Peter S.**; c/o The Board of Trustees of the Leland Stanford Junior University, Office of the General Counsel, Bldg. 170, Third Floor, Main Quad, P.O. Box 20386, Stanford, California 94305-2038 (US).

(54) Title: IMMUNOGENIC CORONAVIRUS FUSION PROTEINS AND RELATED METHODS

Figure 1A



(57) Abstract: Provided are fusion proteins including an amino acid sequence of an ectodomain of Spike protein of a coronavirus, such as SARS-CoV-2, joined to an amino acid sequence of a ferritin subunit polypeptide. Nanoparticles including such fusion proteins, with surface-exposed trimers of the ectodomain of the Spike protein of the coronavirus, are also provided. Also provided are nucleic acids and vectors encoding the fusion proteins, cells containing such nucleic acid and vectors, immunogenic compositions including the fusion proteins, the nanoparticles, or the vectors, as well as corresponding methods and kits.

[Continued on next page]

(74) **Agent: POLOVNIKOVA, Elena S.** et al.; Kilpatrick Townsend & Stockton LLP, Mailstop: IP Docketing - 22, 1100 Peachtree Street, Suite 2800, Atlanta, Georgia 30309 (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, 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).

Published:

- with international search report (Art. 21(3))
- with sequence listing part of description (Rule 5.2(a))