

ANTIBODIES AGAINST SARS-COV-2

STATEMENT REGARDING SEQUENCE LISTING

The Sequence Listing associated with this application is provided in text format in lieu of a paper copy, and is hereby incorporated by reference into the
5 specification. The name of the text file containing the Sequence Listing is 930585_409WO_SEQUENCE_LISTING.txt. The text file is 489 KB, was created on May 7, 2021, and is being submitted electronically via EFS-Web.

BACKGROUND

A novel betacoronavirus emerged in Wuhan, China, in late 2019. As of May 2,
10 2021, approximately 152 million cases of infection by this virus (termed, among other names, SARS-CoV-2 and Wuhan coronavirus) were confirmed worldwide, and had resulted in approximately 3.195 million deaths. Therapies for preventing or treating SARS-CoV-2 infection are needed.

SUMMARY

In one aspect, provided herein is an antibody, or antigen-binding fragment thereof, comprising a heavy chain variable domain (VH) comprising a CDRH1, a CDRH2, and a CDRH3, and a light chain variable domain (VL) comprising a CDRL1, a CDRL2, and a CDRL3, wherein: (i) the CDRH1 comprises or consists of the amino
20 acid sequence according to any one of SEQ ID NOs.: 400, 23, 33, 43, 53, 63, 75, 85, 97, 107, 120, 130, 140, 147, 160, 170, 174, 183, 190, 199, 209, 219, 229, 241, 255, 265, 275, 285, 299, 313, 323, 333, 370, 380, 390, 410, 420, 430, 435, 445, 455, 465, 475, 485, 495, 505, 515, 525, 535, 545, 555, 565, 575, 585, 595, 605, 615, 631, and 693, or a sequence variant thereof comprising one, two, or three acid substitutions, one or more
25 of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid; (ii) the CDRH2 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 401, 24, 34, 44, 54, 64, 76, 86, 98, 108, 121, 131, 141, 148, 151, 161, 171, 184, 200, 210, 220, 230, 242, 256, 266, 276,

286, 300, 314, 324, 334, 352, 360, 362, 364, 366, 371, 381, 391, 411, 421, 431, 436,
446, 456, 466, 476, 486, 496, 506, 516, 526, 536, 546, 556, 566, 576, 586, 596, 606,
616, 625, 632, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661,
663, 665, 667, 669, 671, 673, 675, 677, 679, 681, 683, 685, and 694, or a sequence
5 variant thereof comprising one, two, or three amino acid substitutions, one or more of
which substitutions is optionally a conservative substitution and/or is a substitution to a
germline-encoded amino acid; (iii) the CDRH3 comprises or consists of the amino
acid sequence according to any one of SEQ ID NOs.: 766, 25, 35, 45, 55, 65, 77, 87, 99,
109, 122, 132, 142, 149, 162, 164, 165, 172, 176, 177, 179, 180, 185, 187, 188, 201,
10 211, 221, 231, 243, 257, 267, 277, 287, 301, 315, 325, 335, 354, 372, 382, 392, 412,
422, 432, 437, 447, 457, 467, 477, 487, 497, 507, 517, 527, 537, 547, 557, 567, 577,
587, 597, 607, 617, 627, 633, 695, 751, 753, 755, 757, 760, 763, 765, and 402, or a
sequence variant thereof comprising one, two, or three amino acid substitutions, one or
more of which substitutions is optionally a conservative substitution and/or is a
15 substitution to a germline-encoded amino acid; (iv) the CDRL1 comprises or consists
of the amino acid sequence according to any one of SEQ ID NOs.: 404, 27, 37, 47, 57,
67, 79, 89, 101, 111, 124, 134, 144, 152, 155, 156, 158, 159, 166, 181, 192, 203, 213,
223, 233, 245, 259, 269, 279, 289, 303, 317, 327, 337, 356, 374, 384, 394, 414, 424,
439, 449, 459, 469, 479, 489, 499, 509, 519, 529, 539, 549, 559, 569, 579, 589, 599,
20 609, 619, 687, and 697, or a sequence variant thereof comprising one, two, or three
amino acid substitutions, one or more of which substitutions is optionally a
conservative substitution and/or is a substitution to a germline-encoded amino acid; (v)
the CDRL2 comprises or consists of the amino acid sequence according to any one of
SEQ ID NOs.: 405, 28, 38, 48, 58, 68, 80, 90, 102, 112, 125, 135, 145, 153, 167, 182,
25 193, 204, 214, 224, 234, 246, 260, 270, 280, 290, 304, 318, 328, 338, 375, 385, 395,
415, 425, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580,
590, 600, 610, 620, 688, and 698, or a sequence variant thereof comprising one, two, or
three amino acid substitutions, one or more of which substitutions is optionally a
conservative substitution and/or is a substitution to a germline-encoded amino acid;
30 and/or (vi) the CDRL3 comprises or consists of the amino acid sequence according to

any one of SEQ ID NOs.: 406, 29, 39, 49, 59, 69, 81, 91, 103, 113, 126, 136, 146, 169, 195, 197, 205, 215, 225, 235, 247, 261, 271, 281, 291, 305, 319, 329, 339, 358, 376, 386, 396, 416, 426, 441, 451, 461, 471, 481, 491, 501, 511, 521, 531, 541, 551, 561, 571, 581, 591, 601, 611, 621, 689, 699, 745 and 747, or a sequence variant thereof
5 comprising having one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid, wherein the antibody or antigen-binding fragment binds SARS-CoV-2 glycoprotein (S).

In another aspect, provided herein is an isolated polynucleotide encoding the
10 antibody or antigen-binding fragment of the disclosure, or encoding a VH, a heavy chain, a VL, and/or a light chain of the antibody or the antigen-binding fragment, wherein, optionally, the polynucleotide comprises deoxyribonucleic acid (DNA) or ribonucleic acid (RNA), wherein the RNA further optionally comprises messenger RNA (mRNA).

15 In another aspect, provided herein is a recombinant vector comprising the polynucleotide of the disclosure.

In another aspect, provided herein is a host cell comprising the polynucleotide of the disclosure and/or the vector of the disclosure, wherein the polynucleotide is heterologous to the host cell.

20 In another aspect, provided herein is a composition comprising: (i) the antibody or antigen-binding fragment of the disclosure; (ii) the polynucleotide of the disclosure; (iii) the recombinant vector of the disclosure; and/or (iv) the host cell of the disclosure, and a pharmaceutically acceptable excipient, carrier, or diluent.

In another aspect, provided herein is a use of the antibody or antigen-binding
25 fragment of the disclosure in the manufacture of a medicament for treating a SARS-CoV-2 infection in a subject.

In another aspect, provided herein is a use of the composition of the disclosure in the manufacture of a medicament for treating a SARS-CoV-2 infection in a subject.

In another aspect, provided herein is an *in vitro* method for producing the
30 antibody or antigen-binding fragment of the disclosure, wherein the method comprises

culturing a host cell expressing the antibody or antigen-binding fragment under conditions and for a time sufficient to produce the antibody, or the antigen-binding fragment.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **Figures 1A-1D** show binding of certain antibodies to SARS-CoV-2 Spike protein RBD and SARS-CoV-1 Spike protein RBD. Human monoclonal antibodies isolated from patients who recovered from SARS-CoV-2 infection were recombinantly expressed and tested for RBD binding by ELISA. Figure 1A shows binding of five antibodies, Figure 1B and Figure 1C each show binding of seven antibodies, and Figure 10 1D shows binding of four antibodies. Two antibodies in the top panel of Figure 1B are shown using black symbols. In Figure 1B, S2X28 binding is represented by a line that stays at or near zero OD for the full range of concentrations tested. In Figure 1B (top), S2X41 binding is represented by the curve with an EC₅₀ of approximately 20.01 ng/ml. In each of Figures 1A-1D, the top panel shows binding to SARS-CoV-2 RBD and the 15 bottom panel shows binding to SARS-CoV-1 RBD. The boxes on the right side of each figure, where present, indicate the calculated EC₅₀ value for the indicated antibody.

CLAIMS

What is claimed is:

1. An antibody, or antigen-binding fragment thereof, comprising a heavy chain variable domain (VH) comprising a CDRH1, a CDRH2, and a CDRH3, and a light chain variable domain (VL) comprising a CDRL1, a CDRL2, and a CDRL3, wherein:

(i) the CDRH1 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 400, 23, 33, 43, 53, 63, 75, 85, 97, 107, 120, 130, 140, 147, 160, 170, 174, 183, 190, 199, 209, 219, 229, 241, 255, 265, 275, 285, 299, 313, 323, 333, 370, 380, 390, 410, 420, 430, 435, 445, 455, 465, 475, 485, 495, 505, 515, 525, 535, 545, 555, 565, 575, 585, 595, 605, 615, 631, and 693, or a sequence variant thereof comprising one, two, or three acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid;

(ii) the CDRH2 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 401, 24, 34, 44, 54, 64, 76, 86, 98, 108, 121, 131, 141, 148, 151, 161, 171, 184, 200, 210, 220, 230, 242, 256, 266, 276, 286, 300, 314, 324, 334, 352, 360, 362, 364, 366, 371, 381, 391, 411, 421, 431, 436, 446, 456, 466, 476, 486, 496, 506, 516, 526, 536, 546, 556, 566, 576, 586, 596, 606, 616, 625, 632, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, 675, 677, 679, 681, 683, 685, and 694, or a sequence variant thereof comprising one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid;

(iii) the CDRH3 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 766, 25, 35, 45, 55, 65, 77, 87, 99, 109, 122, 132, 142, 149, 162, 164, 165, 172, 176, 177, 179, 180, 185, 187, 188, 201, 211, 221, 231, 243, 257, 267, 277, 287, 301, 315, 325, 335, 354, 372, 382, 392, 412, 422, 432, 437, 447, 457, 467, 477, 487, 497, 507, 517, 527, 537, 547, 557, 567, 577, 587, 597, 607, 617, 627,

633, 695, 751, 753, 755, 757, 760, 763, 765, and 402, or a sequence variant thereof comprising one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid;

(iv) the CDRL1 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 404, 27, 37, 47, 57, 67, 79, 89, 101, 111, 124, 134, 144, 152, 155, 156, 158, 159, 166, 181, 192, 203, 213, 223, 233, 245, 259, 269, 279, 289, 303, 317, 327, 337, 356, 374, 384, 394, 414, 424, 439, 449, 459, 469, 479, 489, 499, 509, 519, 529, 539, 549, 559, 569, 579, 589, 599, 609, 619, 687, and 697, or a sequence variant thereof comprising one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid;

(v) the CDRL2 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 405, 28, 38, 48, 58, 68, 80, 90, 102, 112, 125, 135, 145, 153, 167, 182, 193, 204, 214, 224, 234, 246, 260, 270, 280, 290, 304, 318, 328, 338, 375, 385, 395, 415, 425, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 688, and 698, or a sequence variant thereof comprising one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid; and/or

(vi) the CDRL3 comprises or consists of the amino acid sequence according to any one of SEQ ID NOs.: 406, 29, 39, 49, 59, 69, 81, 91, 103, 113, 126, 136, 146, 169, 195, 197, 205, 215, 225, 235, 247, 261, 271, 281, 291, 305, 319, 329, 339, 358, 376, 386, 396, 416, 426, 441, 451, 461, 471, 481, 491, 501, 511, 521, 531, 541, 551, 561, 571, 581, 591, 601, 611, 621, 689, 699, 745 and 747, or a sequence variant thereof comprising having one, two, or three amino acid substitutions, one or more of which substitutions is optionally a conservative substitution and/or is a substitution to a germline-encoded amino acid,

wherein the antibody or antigen-binding fragment binds SARS-CoV-2 glycoprotein (S).

2. The antibody or antigen-binding fragment of claim 1, comprising CDRH1, CDRH2, CDRH3, CDRL1, CDRL2, and CDRL3 amino acid sequences of SEQ ID NOs.:

- (i) 400, 401, 766, and 404-406, respectively;
- (ii) 400-402 and 404-406, respectively;
- (iii) 43-45 and 47-49, respectively;
- (iv) 53-55 and 57-59, respectively;
- (v) 63-65 and 67-69, respectively;
- (vi) 75-77 and 79-81, respectively;
- (vii) 85-87 and 89-91, respectively;
- (viii) 97-99 and 101-103, respectively;
- (ix) 107-109 and 111-113, respectively;
- (x) 120-122 and 124-126, respectively;
- (xi) 130-132 and 134-136, respectively;
- (xii) 23 or 147, any one of 24, 148 or 151, 25 or 149, any one of 27, 152, 155, 156, 158, or 159, 28 or 153, and 29, respectively;
- (xiii) 43 or 160, 44 or 161, any one of 45, 162, 164, or 165, 47 or 166, 48 or 167, and 49 or 169, respectively;
- (xiv) any one of 130, 170, or 174, 130, 131, 132, 134 or 181, 135 or 182, and 136, respectively;
- (xv) any one of 53, 183, or 190, 54 or 184, any one of 55, 185, 187, or 188, 57 or 192, 58 or 193, and any one of 59, 195, or 197, respectively;
- (xvi) 199-201 and 203-205, respectively;
- (xvii) 209-211 and 213-215, respectively;
- (xviii) 219-221 and 223-225, respectively;
- (xix) 229-231 and 233-235, respectively;
- (xx) 241-243 and 245-247, respectively;
- (xxi) 255-257 and 259-261, respectively;
- (xxii) 265-267 and 269-271, respectively;
- (xxiii) 275-277 and 279-281, respectively;

(xxiv) 285-287 and 289-291, respectively;

(xxv) 299-301 and 303-305, respectively;

(xxvi) 313-315 and 317-319, respectively;

(xxvii) 323-325 and 327-329, respectively;

(xxviii) 333-335 and 337-339, respectively;

(xxix) 229, 230 or 352, 231 or 354, and 233 or 356, 234, and 235 or 358,
respectively;

(xxx) 313, any one of 314, 360, 362, 364, or 366, 315 and 317-319,
respectively;

(xxxi) 370-372 and 374-376, respectively;

(xxxii) 380-382 and 384-386, respectively;

(xxxiii) 390-392 and 394-396, respectively;

(xxxiv) 23-25 and 27-29, respectively;

(xxxv) 410-412 and 414-416, respectively;

(xxxvi) 420-422 and 424-426, respectively;

(xxxvii) 435-437 and 439-441, respectively;

(xxxviii) 445-447 and 449-451, respectively;

(xxxix) 455-457 and 459-461, respectively;

(xxxx) 465-467 and 469-471, respectively;

(xxxxi) 475-477 and 479-481, respectively;

(xxxxii) 485-487 and 489-491, respectively;

(xxxxiii) 494-497 and 499-501, respectively;

(xxxxiv) 505-507 and 509-511, respectively;

(xxxxv) 515-517 and 519-521, respectively;

(xxxxvi) 525-527 and 529-531, respectively;

(xxxxvii) 535-537 and 539-541, respectively;

(xxxxviii) 545-547 and 549-551, respectively;

(xxxxix) 555-557 and 559-561, respectively;

(xxxxx) 565-567 and 569-571, respectively;

(xxxxxi) 575-577 and 579-581, respectively;

(xxxxxii) 585, 586 or 625, 587 or 627, and 589-591, respectively;

(xxxxxiii) 595-597 and 599-601, respectively;

(xxxxxiv) 605-607 and 609-611, respectively;

(xxxxxv) 615-617 and 619-621, respectively;

(xxxxxvi) 631, 632 or 635 or 637 or 639 or 641 or 643 or 645 or 647 or 649 or 651 or 653 or 655 or 657 or 659 or 661 or 663 or 665 or 667 or 669 or 671 or 673 or 675 or 677 or 679 or 681 or 683 or 685, 633, and 697-699, respectively;

(xxxxxvii) 693-695 and 697-699, respectively;

(xxxxxviii) 400, 401 and any one of 751, 753, 755, 757, or 760 and 404, 405, and any one of 745 or 747, respectively;

(xxxxxxix) 585, 586, and 762 or 764 and 589-591, respectively;

(xxxxxxx) 33-35 and 37-39, respectively;

(xxxxxxxi) 400, 401, 766, 404, 405 or variant of 405 comprising one, two, or three amino acid substitutions, wherein each of the one, two, or three amino acid substitutions is optionally a conservative amino acid substitution, and 406, respectively;

(xxxxxxxii) 631-633 and 687-689, respectively; or

(xxxxxxxiii) 631, 643, 633, 687, 688, and 689, respectively.

3. The antibody or antigen-binding fragment of claim 1 or 2, wherein:

(i) the VH comprises or consists of an amino acid sequence having at least 85% (*e.g.*, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%) identity to the amino acid sequence according to any one of SEQ ID NOs.: 399, 22, 32, 42, 52, 62, 72, 74, 84, 96, 106, 119, 129, 139, 150, 163, 173, 175, 178, 186, 189, 191, 198, 208, 218, 228, 240, 254, 264, 274, 284, 298, 312, 322, 332, 350, 351, 353, 359, 361, 363, 365, 367, 368, 369, 379, 389, 409, 419, 429, 434, 444, 454, 464, 474, 484, 494, 504, 514, 524, 534, 544, 554, 564, 574, 584, 594, 604, 614, 624, 626, 628, 630, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, 676, 678, 680, 682, 684, 692, 740, 741, 742, 743, 748, 749, 750, 752, 754, 756, 758, 759, 761, 762, and 764, wherein the variation is

optionally limited to one or more framework regions and/or the variation comprises one or more substitution to a germline-encoded amino acid; and/or

(ii) the VL comprises or consists of an amino acid sequence having at least 85% (*e.g.*, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%) identity to the amino acid sequence according to any one of SEQ ID NOs.: 738, 26, 36, 46, 56, 66, 78, 88, 94, 100, 110, 123, 133, 143, 154, 157, 168, 194, 196, 202, 212, 222, 232, 238, 244, 250, 252, 258, 268, 278, 288, 294, 296, 302, 308, 310, 316, 326, 336, 355, 357, 373, 383, 393, 403, 413, 423, 438, 448, 458, 468, 478, 488, 498, 508, 518, 528, 538, 548, 558, 568, 578, 588, 598, 608, 618, 686, 696, 744, and 746, wherein the variation is optionally limited to one or more framework regions and/or the variation comprises one or more substitution to a germline-encoded amino acid.

4. The antibody or antigen-binding fragment of any one of claims 1-3, wherein the VH comprises or consists of any VH amino acid sequence set forth in Table 2, and wherein the VL comprises or consists of any VL amino acid sequence set forth in Table 2, wherein, optionally, the VH and the VL comprise or consist of the amino acid sequences according to SEQ ID NOs.:

- (i) 399 and 403 or 738, respectively;
- (ii) 32 and 36, respectively;
- (iii) 42 and 46, respectively;
- (iv) 52 and 56, respectively;
- (v) 62 and 66, respectively;
- (vi) 72 and 66, respectively;
- (vii) 74 and 78, respectively;
- (viii) 84 and 88, respectively;
- (ix) 84 and 88, respectively;
- (x) 96 and 100, respectively;
- (xi) 106 and 110, respectively;
- (xii) 119 and 123, respectively; or

- (xiii) 129 and 133, respectively;
- (xiv) 22 or 150 and 26, 154, or 157, respectively;
- (xv) 42 or 163 and 46 or 168, respectively;
- (xvi) any one of 129, 173, 175, or 178 and 133, respectively;
- (xvii) any one of 52, 186, 189, or 191 and any one of 56, 194, or 196,
respectively;
- (xviii) 198 and 202, respectively;
- (xix) 208 and 212, respectively;
- (xx) 218 and 222, respectively;
- (xxi) 228 and 232 or 238, respectively;
- (xxii) 240 and any one of 244, 250, or 252, respectively;
- (xxiii) 254 and 258, respectively;
- (xxiv) 264 and 268, respectively;
- (xxv) 274 and 278, respectively; or
- (xxvi) 284 and any one of 288, 294, or 296, respectively;
- (xxvii) 298 and any one of 302, 308, or 310, respectively;
- (xxviii) 312 and 316, respectively;
- (xxix) 322 and 326, respectively;
- (xxx) 332 and 336, respectively;
- (xxxi) any one of 228, 350, 351, or 353 and 232, 238, 355, or 357,
respectively;
- (xxxii) any one of 312, 359, 361, 363, 365, 367, or 368 and 316,
respectively;
- (xxxiii) 369 and 373, respectively;
- (xxxiv) 379 and 383, respectively;
- (xxxv) 389 and 393, respectively;
- (xxxvi) 22 and 26, respectively;
- (xxxvii) 409 and 413, respectively;
- (xxxviii) 419 and 423, respectively;
- (xxxix) 434 and 438, respectively;

(xxxx) 444 and 448, respectively;
 (xxxxi) 454 and 458, respectively;
 (xxxxii) 464 and 468, respectively;
 (xxxxiii) 474 and 478, respectively;
 (xxxxiv) 484 and 488, respectively;
 (xxxxv) 494 and 498, respectively;
 (xxxxvi) 504 and 508, respectively;
 (xxxxvii) 514 and 518, respectively;
 (xxxxviii) 524 and 528, respectively;
 (xxxxix) 534 and 538, respectively;
 (xxxxx) 544 and 548, respectively;
 (xxxxxi) 554 and 558, respectively;
 (xxxxxii) 564 and 568, respectively;
 (xxxxxiii) 574 and 578, respectively;
 (xxxxxiv) 584 and 588, respectively;
 (xxxxxv) 594 and 598, respectively;
 (xxxxxvi) 604 and 608, respectively;
 (xxxxxvii) 614 and 618, respectively;
 (xxxxxviii) 624, 626, or 628 and 588, respectively;
 (xxxxxix) 630, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658,
 660, 662, 664, 666, 668, 670, 672, 674, 676, 678, 680, 682, or 684, and 686,
 respectively;
 (xxxxxx) 692 and 696, respectively;
 (xxxxxxxi) any one of 740-743 and 238, respectively;
 (xxxxxxxii) any one of 399, 748, 749, 750, 752, 754, 756, 758, 759, and 761 and
 any one of 403, 744, and 746, respectively; or
 (xxxxxxxiii) 762 or 764 and 588, respectively.

5. The antibody or antigen-binding fragment of claim 4, wherein the VH
 and VL comprise or consist of the amino acid sequences set forth in SEQ ID NOs.:

- (i) 642 and 686, respectively; or
- (ii) 630 and 686, respectively.

6. The antibody or antigen-binding fragment of any one of claims 1-5, which is capable of neutralizing a SARS-CoV-2 infection in an *in vitro* model of infection and/or in an *in vivo* animal model of infection and/or in a human.

7. The antibody or antigen-binding fragment of any one of claims 1-6, which is an IgG, IgA, IgM, IgE, or IgD isotype, and is preferably an IgG isotype selected from IgG1, IgG2, IgG3, and IgG4, and is more preferably an IgG1 isotype.

8. The antibody or antigen-binding fragment of any one of claims 1-7,

(1) which is human, humanized, or chimeric, and/or

(2) wherein the antibody, or the antigen-binding fragment, comprises a human antibody, a monoclonal antibody, a purified antibody, a single chain antibody, a Fab, a Fab', a F(ab')₂, a Fv, a scFv, or a scFab and/or

(3) wherein the antibody or antigen-binding fragment is a multi-specific antibody or antigen binding fragment, wherein optionally, the antibody or antigen binding fragment is a bispecific antibody or antigen-binding fragment.

9. The antibody or antigen-binding fragment of any one of claims 1-8, wherein the antibody or antigen-binding fragment further comprises a Fc polypeptide or a fragment thereof, wherein, optionally, the Fc polypeptide or fragment thereof comprises:

(i) a mutation that enhances binding to a FcRn as compared to a reference Fc polypeptide that does not comprise the mutation; and/or

(ii) a mutation that enhances binding to a Fc γ R as compared to a reference Fc polypeptide that does not comprise the mutation, wherein, further optionally,

(1) the mutation that enhances binding to a FcRn comprises: M428L; N434S; N434H; N434A; N434S; M252Y; S254T; T256E; T250Q; P257I; Q311I; D376V; T307A; E380A; or any combination thereof, wherein, even further optionally, the mutation that enhances binding to FcRn comprises:

- (i) M428L/N434S;
- (ii) M252Y/S254T/T256E;
- (iii) T250Q/M428L;
- (iv) P257I/Q311I;
- (v) P257I/N434H;
- (vi) D376V/N434H;
- (vii) T307A/E380A/N434A; or
- (viii) any combination of (i)-(vii); and/or

(2) the mutation that enhances binding to a Fc γ R comprises S239D; I332E; A330L; G236A; or any combination thereof, wherein, further optionally, the mutation that enhances binding to a Fc γ R comprises:

- (i) S239D/I332E;
- (ii) S239D/A330L/I332E;
- (iii) G236A/S239D/I332E; or
- (iv) G236A/A330L/I332E.

10. The antibody or antigen-binding fragment of any one of claims 1-9, comprising:

- (a) the CH1-CH3 amino acid sequence set forth in SEQ ID NO.:6 and the CL amino acid sequence set forth in SEQ ID NO.:8;
- (b) The CH1-CH3 amino acid sequence set forth in SEQ ID NO.:6 and the CL amino acid sequence set forth in SEQ ID NO.:9;

(c) the CH1-CH3 amino acid sequence set forth in SEQ ID NO.:7 and the CL amino acid sequence set forth in SEQ ID NO.:8; or

(d) The CH1-CH3 amino acid sequence set forth in SEQ ID NO.:7 and the CL amino acid sequence set forth in SEQ ID NO.:9.

11. An isolated polynucleotide encoding the antibody or antigen-binding fragment of any one of claims 1-10, or encoding a VH, a heavy chain, a VL, and/or a light chain of the antibody or the antigen-binding fragment, wherein, optionally, the polynucleotide comprises deoxyribonucleic acid (DNA) or ribonucleic acid (RNA), wherein the RNA further optionally comprises messenger RNA (mRNA).

12. A recombinant vector comprising the polynucleotide of claim 11.

13. A host cell comprising the polynucleotide of claim 11 and/or the vector of claim 12, wherein the polynucleotide is heterologous to the host cell.

14. A composition comprising:

- (i) the antibody or antigen-binding fragment of any one of claims 1-10;
- (ii) the polynucleotide of claim 11;
- (iii) the recombinant vector of claim 12; and/or
- (iv) the host cell of claim 13,

and a pharmaceutically acceptable excipient, carrier, or diluent.

15. The antibody or antigen-binding fragment of any one of claims 1-10, the polynucleotide of claim 11, the recombinant vector of claim 12, the host cell of claim 13, and/or the composition of claim 14 for use as a medicament.

16. Use of the antibody or antigen-binding fragment of any one of claims 1-10 in the manufacture of a medicament for treating a SARS-CoV-2 infection in a subject.

17. Use of the composition of claim 14 in the manufacture of a medicament for treating a SARS-CoV-2 infection in a subject.

18. An *in vitro* method for producing the antibody or antigen-binding fragment of any one of claims 1-10, wherein the method comprises culturing a host cell expressing the antibody or antigen-binding fragment under conditions and for a time sufficient to produce the antibody, or the antigen-binding fragment.

19. The *in vitro* method of claim 18, wherein the method comprises culturing the host cell in batch cell culture.

20. The *in vitro* method of claim 18 or 19, wherein the method further comprises purifying the antibody or antigen-binding fragment.