

WHAT IS CLAIMED IS: CLAIMS

1. An isolated antibody comprising a heavy chain variable region (VH) and a light chain variable region (VL), wherein the VH comprises the amino acid sequence of SEQ ID NO: 30012 and the VL comprises the amino acid sequence of SEQ ID NO: 30018.
2. The isolated antibody of claim 1, wherein the antibody is clone 22, wherein the heavy chain and light chain protein sequences of clone 22 are SEQ ID NOs: 30019 and 30021, respectively.
- ~~4.~~3. An isolated antibody comprising:
 - i) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 1; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 2; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 3; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 4; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 5; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 6; or
 - ii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 101; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 102; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 103; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 104; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 105; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 106; or
 - iii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 201; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 202; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 203; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 204; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 205; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 206; or
 - iv) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 301; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 302; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 303; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 304; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 305; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 306; or

- v) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 401; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 402; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 403; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 404; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 405; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 406; or
- vi) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 501; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 502; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 503; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 504; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 505; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 506; or
- vii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 601; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 602; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 603; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 604; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 605; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 606; or
- viii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 701; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 702; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 703; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 704; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 705; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 706; or
- ix) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 801; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 802; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 803; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 804; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 805; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 806; or
- x) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 901; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 902; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 903; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 904; (e) LCDR2

- comprising the amino acid sequence of SEQ ID NO: 905; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 906; or
- xi) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 1001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 1002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 1003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 1004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 1005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 1006; or
- xii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 2001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 2002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 2003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 2004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 2005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 2006; or
- xiii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 3001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 3002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 3003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 3004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 3005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 3006; or
- xiv) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 4001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 4002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 4003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 4004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 4005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 4006; or
- xv) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 5001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 5002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 5003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 5004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 5005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 5006; or
- xvi) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 6001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 6002; (c)

- HCDR3 comprising the amino acid sequence of SEQ ID NO: 6003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 6004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 6005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 6006; or
- xvii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 7001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 7002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 7003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 7004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 7005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 7006; or
- xviii) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 8001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 8002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 8003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 8004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 8005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 8006; or
- xix) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 9001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 9002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 9003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 9004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 9005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 9006; or
- xx)(a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 10001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 10002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 10003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 10004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 10005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 10006; or
- ~~xxi) (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 20001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 20002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 20003; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 20004; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 20005; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 20006; or~~

~~xxii)xx)~~ (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 30001; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 30002; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 30003; (d) ~~L~~CDR1 comprising the amino acid sequence of SEQ ID NO: 30004; (e) ~~L~~CDR2 comprising the amino acid sequence of SEQ ID NO: 30005; and (f) ~~L~~CDR3 comprising the amino acid sequence of SEQ ID NO: 30006.

2.4. The isolated antibody of claim 13, wherein the antibody comprises a heavy chain variable region (VH) and a light chain variable region (VL), wherein:

- i) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 12 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 18; or
- ii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 112 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 118; or
- iii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 212 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 218; or
- iv) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 312 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 318; or
- v) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 412 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 418; or
- vi) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 512 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 518; or
- vii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 612 and the VL is at

- least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 618; or
- viii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 712 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 718; or
 - ix) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 812 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 818; or
 - x) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 912 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 918; or
 - xi) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 1012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 1018; or
 - xii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 2012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 2018; or
 - xiii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 3012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 3018; or
 - xiv) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 4012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 4018; or
 - xv) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 5012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 5018; or

- xvi) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 6012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 6018; or
- xvii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 7012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 7018; or
- xviii) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 8012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 8018; or
- xix) the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 9012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 9018; or
- ~~xx)~~ the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 10012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 10018; ~~or~~
- ~~xxi)~~ ~~the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 20012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 20018; or~~
- ~~xxii)~~~~xx)~~ ~~the VH is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 30012 and the VL is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100% identical to the amino acid sequence of SEQ ID NO: 30018.~~

3.5. The isolated antibody of claim 13 or claim 24, wherein the antibody:

(a) comprises a heavy chain variable region (VH) and a light chain variable region (VL), wherein:

- i) the VH comprises the amino acid sequence of SEQ ID NO: 12 and the VL comprises the amino acid sequence of SEQ ID NO: 18; or

- ii) the VH comprises the amino acid sequence of SEQ ID NO: 112 and the VL comprises the amino acid sequence of SEQ ID NO: 118; or
- iii) the VH comprises the amino acid sequence of SEQ ID NO: 212 and the VL comprises the amino acid sequence of SEQ ID NO: 218; or
- iv) the VH comprises the amino acid sequence of SEQ ID NO: 312 and the VL comprises the amino acid sequence of SEQ ID NO: 318; or
- v) the VH comprises the amino acid sequence of SEQ ID NO: 412 and the VL comprises the amino acid sequence of SEQ ID NO: 418; or
- vi) the VH comprises the amino acid sequence of SEQ ID NO: 512 and the VL comprises the amino acid sequence of SEQ ID NO: 518; or
- vii) the VH comprises the amino acid sequence of SEQ ID NO: 612 and the VL comprises the amino acid sequence of SEQ ID NO: 618; or
- viii) the VH comprises the amino acid sequence of SEQ ID NO: 712 and the VL comprises the amino acid sequence of SEQ ID NO: 718; or
- ix) the VH comprises the amino acid sequence of SEQ ID NO: 812 and the VL comprises the amino acid sequence of SEQ ID NO: 818; or
- x) the VH comprises the amino acid sequence of SEQ ID NO: 912 and the VL comprises the amino acid sequence of SEQ ID NO: 918; or
- xi) the VH comprises the amino acid sequence of SEQ ID NO: 1012 and the VL comprises the amino acid sequence of SEQ ID NO: 1018; or
- xii) the VH comprises the amino acid sequence of SEQ ID NO: 2012 and the VL comprises the amino acid sequence of SEQ ID NO: 2018; or
- xiii) the VH comprises the amino acid sequence of SEQ ID NO: 3012 and the VL comprises the amino acid sequence of SEQ ID NO: 3018; or
- xiv) the VH comprises the amino acid sequence of SEQ ID NO: 4012 and the VL comprises the amino acid sequence of SEQ ID NO: 4018; or
- xv) the VH comprises the amino acid sequence of SEQ ID NO: 5012 and the VL comprises the amino acid sequence of SEQ ID NO: 5018; or
- xvi) the VH comprises the amino acid sequence of SEQ ID NO: 6012 and the VL comprises the amino acid sequence of SEQ ID NO: 6018; or
- xvii) the VH comprises the amino acid sequence of SEQ ID NO: 7012 and the VL comprises the amino acid sequence of SEQ ID NO: 7018; or
- xviii) the VH comprises the amino acid sequence of SEQ ID NO: 8012 and the VL comprises the amino acid sequence of SEQ ID NO: 8018; or

- xix) the VH comprises the amino acid sequence of SEQ ID NO: 9012 and the VL comprises the amino acid sequence of SEQ ID NO: 9018; or
- xx) the VH comprises the amino acid sequence of SEQ ID NO: 10012 and the VL comprises the amino acid sequence of SEQ ID NO: 10018; or
- ~~xxi) the VH comprises the amino acid sequence of SEQ ID NO: 20012 and the VL comprises the amino acid sequence of SEQ ID NO: 20018; or~~
- ~~xxii) the VH comprises the amino acid sequence of SEQ ID NO: 30012 and the VL comprises the amino acid sequence of SEQ ID NO: 30018.~~
- (b) is clone 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 or a CD39 binding fragment thereof.
- ~~4. The isolated antibody of any one of the preceding claims, wherein the antibody is clone 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, or 21 or a CD39 binding fragment thereof.~~
- 5.6. The isolated antibody of any one of the preceding claims, wherein the antibody is:
 - (a) a monoclonal antibody;
 - (b) an antibody fragment, wherein the antibody fragment binds CD39, optionally wherein the fragment is a Fab, Fab', Fv, scFv or (Fab')₂; or
 - (c) a full-length antibody.
- ~~6. The isolated antibody of any one of the preceding claims, wherein the antibody is an antibody fragment, wherein the antibody fragment binds CD39.~~
- ~~7. The isolated antibody of claim 6, wherein the fragment is a Fab, Fab', Fv, scFv or (Fab')₂.~~
- ~~8. The isolated antibody of any one of claims 1-5, wherein the antibody is a full-length antibody.~~
- 9.7. The isolated antibody of any one of claims 1-86, wherein the Fc region of the antibody comprises IgG1, IgG2, IgG3, or IgG4.
- 10.8. The isolated antibody of any one of claims 1-97, wherein the antibody comprises a human IgG1 or IgG4 heavy chain constant region, optionally wherein the human IgG4 heavy chain constant region is a mutant human IgG4 heavy chain constant region.
- ~~11. The isolated antibody of any one of claims 1-9, wherein the antibody comprises a human IgG4 heavy chain constant region.~~
- ~~12. The isolated antibody of claim 11, wherein the antibody comprises a mutant human IgG4 heavy chain constant region.~~

- ~~13.9.~~ The isolated antibody of claim ~~12~~8, wherein the mutant IgG4 heavy chain constant region comprises:
- (a) a mutation selected from a substitution at Ser228, a substitution at Leu235, a substitution at Asn297, or a combination thereof, numbering according to EU numbering; or
 - (b) an S228P substitution.
- ~~14.~~ The isolated antibody of claim ~~12~~, wherein the mutant IgG4 heavy chain constant region comprises an S228P substitution.
- ~~15.10.~~ The isolated antibody of any one of claims ~~1-9 and 11-14~~, comprising:
- (a) the heavy chain constant region of SEQ ID NO: 40002; or
 - (b) the heavy chain constant region of SEQ ID NO: 40003.
- ~~16.~~ The isolated antibody of any one of claims ~~1-9 and 11-15~~, comprising the heavy chain constant region of SEQ ID NO: 40003.
- ~~17.~~ An isolated antibody comprising the light chain variable region of SEQ ID NO: 30018 and the heavy chain variable region of SEQ ID NO: 30012.
- ~~18.11.~~ The isolated antibody of any one of claims ~~1-16~~10, comprising a human kappa light chain.
- ~~19.12.~~ The isolated antibody of any one of the preceding claims, wherein the antibody:
- (a) binds to and inhibits CD39;
 - (b) binds to CD39 and inhibits CD39 within a normal or cancerous tissue, optionally wherein the tissue is in the uterus, cervix, lung, prostate, breast, head, neck, colon, or ovary; or
 - (c) is humanized or fully human.
- ~~20.13.~~ The isolated antibody of ~~any one of the preceding claims~~ claim 12, wherein the antibody binds to CD39 and inhibits CD39 within a normal or cancerous tissue and the tissue is in the uterus, optionally wherein within the uterus, the antibody inhibits CD39 in the myometrium.
- ~~14.~~ The isolated antibody of any one of claims ~~1 to 4~~, wherein:
- (a) the K_D for binding to human CD39 is about 1.11 nM; or
 - (b) the antibody binds to human CD39 and cynomolgus monkey CD39 but does not bind to mouse CD39 or rat CD39.
- ~~21.~~ The isolated antibody of claim ~~20~~, wherein the tissue is in the uterus, cervix, lung, prostate, breast, head, neck, colon, or ovary.
- ~~22.~~ The isolated antibody of claim ~~21~~, wherein the tissue is in the uterus.

- ~~23. The isolated antibody of claim 22, wherein within the uterus, the antibody inhibits CD39 in the myometrium.~~
- ~~24. A humanized or fully human version of the antibody of any one of the preceding claims.~~
- ~~25.15. A composition comprising the antibody of any one of claims 1-24~~14 and a pharmaceutically acceptable carrier.
- ~~26.16. The composition of claim 25~~15 further comprising an antagonist of PD-1, PD-L1, CTLA-4, Lag-3, TIM-3, A2AR, A2BR, dual A2AR/A2BR, CD40 or CD73, and/or an antagonist of TIGIT, CD112R, or CD96, and/or an antagonist of PVRL1, PVRL2, PVRL3, PVRL4, or CD155, and/or an antagonist of CD47, or IL-27, and/or an agonist of STING, and/or a CAR cell therapy.
17. A nucleic acid encoding the antibody of any one of claims 1-14.
18. A host cell comprising the nucleic acid of claim 17.
19. A method of producing the antibody of any one of claims 1-14 comprising culturing the host cell of claim 18 under conditions wherein the antibody is expressed.
20. The method of claim 19, further comprising purifying the antibody.
21. A kit comprising the antibody of any one of claims 1-14, the composition of claim 15 or 16, the nucleic acid of claim 17, the host cell of claim 18, or any combination thereof.
- ~~27.22. A method of~~ Use of the antibody of any one of claims 1-14, or the composition of claim 15 or 16 in the manufacture of a medicament for:
- (a) enhancing, increasing and/or sustaining an anti-tumor immune response in a subject comprising administering the antibody of any one of claims 1-24 or the composition of claim 25 or 26 to a subject having a tumor;
- (b) treating cancer in a subject having cancer; or
- (c) inhibiting CD39 in a tissue of a subject having cancer wherein the antibody or composition reduces CD39 activity or total amount of CD39 in the tissue as compared to the activity or amount prior to the antibody or composition.
- ~~28. A method of treating cancer in a subject comprising administering the antibody of any one of claims 1-24 or the composition of claim 25 or 26 to a subject having cancer.~~
- ~~29. A method of inhibiting CD39 in a tissue of a subject having cancer comprising administering the antibody of any one of claims 1-24 or the composition of claim 25 or 26 to a subject having a cancer, wherein the administration reduces CD39~~

activity or total amount of CD39 in the tissue as compared to the activity or amount prior to administration.

~~30.~~ 23. The ~~method~~ use of claim ~~28~~ or ~~29~~ 22, wherein the cancer is:

(a) advanced;

(b) relapsed;

(c) refractory;

(d) metastatic;

(e) an advanced solid tumor;

(f) a relapsed solid tumor;

(g) a refractory solid tumor;

(h) a metastatic solid tumor;

(i) carcinoma, lymphoma, blastoma, sarcoma, or leukemia;

(j) pancreatic cancer;

(k) gastric cancer;

(l) prostate cancer;

(m) endometrial cancer;

(n) non-small cell lung cancer;

(o) colorectal cancer;

(p) ovarian cancer; or

(q) squamous cell cancer, small-cell lung cancer, pituitary cancer, esophageal cancer, astrocytoma, soft tissue sarcoma, non-small cell lung cancer (including squamous cell non-small cell lung cancer), adenocarcinoma of the lung, squamous carcinoma of the lung, cancer of the peritoneum, hepatocellular cancer, gastrointestinal cancer, pancreatic cancer, glioblastoma, cervical cancer, ovarian cancer, liver cancer, bladder cancer, hepatoma, breast cancer, colon cancer, colorectal cancer, endometrial or uterine carcinoma, salivary gland carcinoma, kidney cancer, renal cell carcinoma, liver cancer, prostate cancer, vulval cancer, thyroid cancer, hepatic carcinoma, brain cancer, endometrial cancer, testis cancer, cholangiocarcinoma, gallbladder carcinoma, gastric cancer, melanoma, or various types of head and neck cancer (including squamous cell carcinoma of the head and neck).

~~31.~~ The method of any one of claims 28 to 30, wherein the cancer is relapsed.

~~32.~~ The method of any one of claims 28 to 31, wherein the cancer is refractory.

~~33.~~ The method of any one of claims 28 to 32, wherein the cancer is metastatic.

34. ~~The method of any one of claims 28-33, wherein the cancer is an advanced solid tumor.~~
35. ~~The method of any one of claims 28 to 34, wherein the cancer is a relapsed solid tumor.~~
36. ~~The method of any one of claims 28 to 35, wherein the cancer is a refractory solid tumor.~~
37. ~~The method of any one of claims 28 to 36, wherein the cancer is a metastatic solid tumor.~~
38. ~~The method of any one of claims 28 to 37, wherein the cancer is carcinoma, lymphoma, blastoma, sarcoma, or leukemia.~~
39. ~~The method of any one of claims 28 to 37, wherein the cancer is pancreatic cancer.~~
40. ~~The method of any one of claims 28 to 37, wherein the cancer is gastric cancer.~~
41. ~~The method of any one of claims 28 to 37, wherein the cancer is prostate cancer.~~
42. ~~The method of any one of claims 28 to 37, wherein the cancer is endometrial cancer.~~
43. ~~The method of any one of claims 28 to 37, wherein the cancer is non-small cell lung cancer.~~
44. ~~The method of any one of claims 28 to 37, wherein the cancer is colorectal cancer.~~
45. ~~The method of any one of claims 28 to 37, wherein the cancer is ovarian cancer.~~
46. ~~The method of any one of claims 28 to 37, wherein the cancer is squamous cell cancer, small cell lung cancer, pituitary cancer, esophageal cancer, astrocytoma, soft tissue sarcoma, non-small cell lung cancer (including squamous cell non-small cell lung cancer), adenocarcinoma of the lung, squamous carcinoma of the lung, cancer of the peritoneum, hepatocellular cancer, gastrointestinal cancer, pancreatic cancer, glioblastoma, cervical cancer, ovarian cancer, liver cancer, bladder cancer, hepatoma, breast cancer, colon cancer, colorectal cancer, endometrial or uterine carcinoma, salivary gland carcinoma, kidney cancer, renal cell carcinoma, liver cancer, prostate cancer, vulval cancer, thyroid cancer, hepatic carcinoma, brain cancer, endometrial cancer, testis cancer, cholangiocarcinoma, gallbladder carcinoma, gastric cancer, melanoma, or various types of head and neck cancer (including squamous cell carcinoma of the head and neck).~~
- 47.24. The method of any one of claims 27-46 use according to claim 22 or 23, wherein the method further comprises administering a second therapy to be administered, optionally wherein the second therapy is:

- (a) radiotherapy or surgery;
- (b) a chemotherapy, an opsonizing agent, or a regulatory T cell depleting agent;
- (c) an antagonist of PD-1, PD-L1, CTLA-4, Lag-3, TIM-3, A2AR, A2BR, dual A2AR/A2BR, CD40 or CD73;
- (d) an antagonist of TIGIT, CD112R, or CD96;
- (e) an antagonist of PVRL1, PVRL2, PVRL3, PVRL4, or CD155;
- (f) an antagonist of CD47;
- (g) an antagonist of IL-27;
- (h) an antagonist of CD73;
- (i) an antagonist of A2AR;
- (j) an antagonist of A2BR;
- (k) a dual A2AR/A2BR antagonist; or
- (l) a STING agonist.

48. ~~The method of claim 47, wherein the second therapy is radiotherapy or surgery.~~

49. ~~The method of claim 47, wherein the second therapy is administration of a chemotherapy, an opsonizing agent, or a regulatory T cell depleting agent.~~

50. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of PD-1, PD-L1, CTLA-4, Lag-3, TIM-3, A2AR, A2BR, dual A2AR/A2BR, CD40 or CD73.~~

51. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of TIGIT, CD112R, or CD96.~~

52. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of PVRL1, PVRL2, PVRL3, PVRL4, or CD155.~~

53. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of CD47.~~

54. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of IL-27.~~

55. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of CD73.~~

56. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of A2AR.~~

57. ~~The method of claim 47, wherein the second therapy is administration of an antagonist of A2BR.~~

58. ~~The method of claim 47, wherein the second therapy is administration of a dual A2AR/A2BR antagonist.~~
59. ~~The method of claim 47, wherein the second therapy is administration of a STING agonist.~~
60. ~~25. The method of any one of claims 50-58 use according to claim 24, wherein the antagonist is an antibody.~~
61. ~~A nucleic acid encoding the antibody of any one of claims 1-24.~~
62. ~~A host cell comprising the nucleic acid of claim 61.~~
63. ~~A method of producing the antibody of any one of claims 1-24 comprising culturing the host cell of claim 62 under conditions wherein the antibody is expressed.~~
64. ~~The method of claim 63, further comprising purifying the antibody.~~
65. ~~A kit comprising the antibody of any one of claims 1-24, the composition of claim 25 or 26, the nucleic acid of claim 61, the host cell of claim 62, or any combination thereof.~~
66. ~~The antibody of claims 2 or 3, wherein the K_D for binding to human CD39 is about 1.11nM.~~
67. ~~The antibody of claims 2 or 3, wherein the antibody binds to human CD39 and cynomolgus monkey CD39 but does not bind to mouse CD39 or rat CD39.~~
68. ~~The method of claim 53, wherein the antagonist of CD47 is an anti-CD47 antibody.~~
69. ~~The method of claim 68, wherein the anti-CD47 antibody comprises a heavy chain variable region (VH) and a light chain variable region (VL), wherein: the VH comprises the amino acid sequence of SEQ ID NO: 40004 and the VL comprises the amino acid sequence of SEQ ID NO: 40005.~~
70. ~~The method of claim 68, wherein the anti-CD47 antibody comprises: (a) HCDR1 comprising the amino acid sequence of SEQ ID NO: 40006; (b) HCDR2 comprising the amino acid sequence of SEQ ID NO: 40007; (c) HCDR3 comprising the amino acid sequence of SEQ ID NO: 40008; (d) LCDR1 comprising the amino acid sequence of SEQ ID NO: 40009; (e) LCDR2 comprising the amino acid sequence of SEQ ID NO: 40010; and (f) LCDR3 comprising the amino acid sequence of SEQ ID NO: 40011.~~
71. ~~The method of claim 47, wherein the second therapy is gemcitabine and albumin-bound paclitaxel.~~
72. ~~The method of claim 47, wherein the second therapy is pembrolizumab.~~

73. — The method of claims 27 to 46, wherein the method further comprises administering a triple combination of cancer therapies.
74. — The method of claim 73, wherein the triple combination of cancer therapies comprises the antibody of any one of claims 1-24, a chemotherapeutic agent, and an antagonist of PD-1 or an antagonist of PD-L1.
75. — The method of claim 73, wherein the triple combination of cancer therapies comprises the antibody of any one of claims 1-24, a chemotherapeutic agent, and an agent targeting the adenosine axis.
76. — The method of claim 73, wherein the triple combination of cancer therapies comprises the antibody of any one of claims 1-24, an antagonist of PD-1 or an antagonist of PD-L1, and an agent targeting the adenosine axis.
77. — The method of claim 75 or claim 76, wherein the agent targeting the adenosine axis is a CD73 inhibitor.
78. — The method of claim 75 or claim 76, wherein the agent targeting the adenosine axis is an A2AR antagonist, an A2BR antagonist, or a dual A2AR/A2B antagonist.
79. — The method of claim 47, wherein the second therapy is administration of an antagonist of PD-1.
80. — The method of claim 79, wherein the antagonist of PD-1 is an anti-PD-1 antibody.
81. — The method of claim 79 or claim 80, wherein the method results in an increase in interferon gamma (IFN- γ) response in the tumor microenvironment.
82. — The method of claim 81, wherein the increase in IFN- γ response is greater than the IFN- γ response from administration of the antagonist of PD-1 alone.
83. — The method of any one of claims 81-82, wherein the IFN- γ response is upregulation of interferon gamma (IFN- γ) related genes in tumor associated macrophages in the tumor microenvironment.
84. — The method of claim 79 or claim 80, wherein the method results in infiltration of innate immune cells into the tumor microenvironment.
85. — The method of claim 84, wherein the innate immune cells are myeloid cells.
86. — The method of claim 84, wherein the innate immune cells are macrophages.
87. — The method of claim 84, wherein the innate immune cells are NK cells.
88. — The method of claims 84-87, wherein the infiltration of innate immune cells is greater than the infiltration of innate immune cells from administration of the antagonist of PD-1 or anti-PD-1 antibody alone.

- 89. ~~The method of claims 27-46, wherein the method results in infiltration of innate immune cells into the tumor microenvironment.~~
- 90. ~~The method of claim 89, wherein the innate immune cells are myeloid cells.~~
- 91. ~~The method of claim 89, wherein the innate immune cells are macrophages.~~
- 92. ~~The method of claim 89, wherein the innate immune cells are NK cells.~~