CLAIMS

1. An isolated antibody or an antigen-binding portion thereof, comprising:

a heavy chain CDR (HCDR) 1 comprising the amino acid sequence of SEQ ID NO: 1;

a HCDR2 comprising the amino acid sequence of SEQ ID NO: 2;

a HCDR3 comprising the amino acid sequence of SEQ ID NO: 3;

a light chain CDR (LCDR) 1 comprising the amino acid sequence of SEQ ID NO: 4;

a LCDR2 comprising the amino acid sequence of any of SEQ ID NOs: 7, 5, 8 and 9; and

a LCDR3 comprising the amino acid sequence of SEQ ID NO: 6.

2. The isolated antibody or the antigen-binding portion thereof of claim 1, comprising a heavy chain variable region (VH) and a light chain variable region (VL), wherein:

the VH comprises:

(i) the amino acid sequence as set forth in any of SEQ ID NOs: 10-11; or

(ii) an amino acid sequence at least 85%, 90%, or 95% identical to any of SEQ ID NOs: 10-11; and

the VL comprises:

(i) the amino acid sequence as set forth in any of SEQ ID NOs: 12-18; or

(ii) an amino acid sequence at least 85%, at least 90%, or at least 95% identical to any of SEQ ID NOs: 12-18.

3. The isolated antibody or the antigen-binding portion thereof of claim 1 or 2, comprising a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 11 and a light chain variable region comprising the amino acid sequence of SEQ ID NO: 15.

4. The isolated antibody or the antigen-binding portion thereof of any of the preceding claims, wherein the isolated antibody further comprises a human IgG constant region.

5. The isolated antibody or the antigen-binding portion thereof of claim 4, wherein the human IgG constant region is a human IgG1, IgG4, IgG2 or IgG3 constant region or a variant thereof.

6. The isolated antibody or the antigen-binding portion thereof of any of the preceding claims, wherein the antibody comprises a human IgG1 Fc region or a human IgG4 Fc region with a S228P substitution.

7. The isolated antibody or the antigen-binding portion thereof of any of the preceding claims, wherein the antibody is a chimeric antibody or a humanized antibody.

8. An isolated nucleic acid molecule, comprising a nucleic acid sequence encoding the heavy chain variable region and/or the light chain variable region of the isolated antibody or the antigen-binding portion thereof of any of claims 1-7.

9. A vector comprising the isolated nucleic acid molecule of claim 8.

10. A host cell comprising the vector of claim 9.

11. A pharmaceutical composition comprising the antibody or the antigen-binding portion thereof as defined in any of claims 1-7 and a pharmaceutically acceptable carrier.

12. A method for producing the antibody or the antigen-binding portion thereof as defined in any of claims 1-7 comprising the steps of:

- culturing a host cell comprising an expression vector(s) encoding the antibody or the antigen-binding portion thereof under suitable conditions; and
- harvesting the antibody or antigen-binding portion thereof from the cell culture.

13. The antibody or the antigen-binding portion thereof as defined in any of claims 1-7 for use in therapy or prevention.

14. Use of the antibody or the antigen-binding portion thereof as defined in any of claims 1-7 in the manufacture of a medicament for inhibiting growth of tumor cells.

15. Use of the antibody or the antigen-binding portion thereof as defined in any of claims 1-7, alone or combined with an anti-PD-1 antibody, in the manufacture of a medicament for treating or preventing cancer or an immune related disorder.

16. The use of claim 15, wherein the cancer is selected from colon cancer, lung cancer, breast cancer, ovarian cancer, melanoma, bladder cancer, renal cell carcinoma, liver cancer, prostate cancer, stomach cancer, pancreatic cancer, lymphoma, leukemia, uterine cancer, cervical cancer, testicular cancer, esophageal cancer, gastrointestinal cancer, gastric cancer, colorectal cancer, kidney cancer, clear cell renal carcinoma, head and neck cancer, germ cell cancer, bone cancer, thyroid cancer, skin cancer, neoplasm of the central nervous system, mesothelioma, myeloma, and sarcoma; preferably, the cancer is colon cancer or lung cancer.

17. The use of claim 15, wherein the immune related disorder is a T cell dysfunctional disorder or an infection.

18. A combination of the isolated antibody or the antigen-binding portion thereof of any of claims 1-7 with an anti-PD-1 antibody.

19. The combination of claim 18 for use in therapy.

20. A kit comprising a container comprising the antibody or the antigen-binding portion thereof as defined in any of claims 1-7.