**CLAIMS**

1. An antigen-binding protein comprising an antigen-binding region A and an antigen-binding region B binding to different antigens or different epitopes of a same antigen, wherein the antigen-binding protein comprises three polypeptide chains: a first polypeptide chain, a second polypeptide chain, and a third polypeptide chain, and wherein:

the first polypeptide chain comprises VH_A-CH1 from the amino terminus (N-terminus) to the carboxyl terminus (C-terminus);

the second polypeptide chain comprises VL_A-CL-L-VH_B-CH1 or VH_B-CH1-L-VL_A-CL from the N-terminus to the C-terminus, and

the third polypeptide chain comprises VL_B-CL from the N-terminus to the C-terminus,

and wherein: VH_A and VL_A are respectively the heavy chain variable region and the light chain variable region derived from antibody A, which constitute the antigen-binding region A; VH_B and VL_B are respectively the heavy chain variable region and the light chain variable region derived from antibody B, which constitute the antigen-binding region B; CL is a light chain constant region domain, wherein the CLs in the second polypeptide chain and the third polypeptide chain comprise constant regions derived from different light chain types; CH1 is the first domain of a heavy chain constant region, wherein the CH1s in the first polypeptide chain and the second polypeptide chain may be the same or different; and L is an optional linker peptide.

2. The antigen-binding protein according to claim 1, wherein the CLs in the second polypeptide chain and the third polypeptide chain each independently comprise a constant region derived from a κ light chain or a λ light chain (Cκ or Cλ).

3. The antigen-binding protein according to claim 2, wherein the CL in the second polypeptide chain comprises the constant region Cκ derived from a κ light chain, and the CL in the third polypeptide chain comprises the constant region Cλ derived from a λ light chain; or wherein the CL in the second polypeptide chain

comprises the constant region Cλ derived from a λ light chain, and the CL in the third polypeptide chain comprises the constant region Cκ derived from a κ light chain.

4. The antigen-binding protein according to any one of claims 1-3, wherein the VL_A and VL_B each independently comprise a variable region derived from a κ light chain or a λ light chain (Vκ or Vλ).

5. The antigen-binding protein according to claim 4, wherein the VL_A comprises a variable region which is derived from the same type of light chain with the light chain constant region comprised in the CL of the second polypeptide chain, and/or the VL_B comprises a variable region which is derived from the same type of light chain with the light chain constant region comprised in the CL of the third polypeptide chain.

6. The antigen-binding protein according to any one of claims 1-5, wherein the CH1s each independently comprise a CH1 region derived from an IgG isotype, such as selected from the CH1 region of IgG1, IgG2, and IgG4, for example selected from the CH1 region of human IgG1, IgG2, and IgG4.

7. The antigen-binding protein according to any one of claims 1-6, wherein:

(a) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VL_A-Cκ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises VL_B-Cλ from the N-terminus to the C-terminus;

(b) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VL_A-Cλ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises VL_B-Cκ from the N-terminus to the C-terminus;

(c) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-VL_A-Cκ from the N-terminus to the C-terminus, and the third polypeptide chain comprises VL_B-Cλ from the N-terminus to the C-terminus;

(d) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to

the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-VL_A-Cλ from the N-terminus to the C-terminus, and the third polypeptide chain comprises VL_B-Cκ from the N-terminus to the C-terminus;

wherein, the VL_A and VL_B each independently comprise a variable region derived from a κ light chain or a λ light chain (Vκ or Vλ), and L is an optional linker peptide.

8. The antigen-binding protein according to any one of claims 1-7, wherein:

(a) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vκ_A-Cκ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cλ from the N-terminus to the C-terminus;

(b) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vκ_A-Cλ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cκ from the N-terminus to the C-terminus;

(c) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vκ_A-Cκ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cλ from the N-terminus to the C-terminus;

(d) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vκ_A-Cλ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cκ from the N-terminus to the C-terminus;

(e) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vκ_A-Cκ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vκ_B-Cλ from the N-terminus to the C-terminus;

(f) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vκ_A-Cλ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises

Vκ_B-Cκ from the N-terminus to the C-terminus;

(g) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vκ_A-Cκ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vκ_B-Cλ from the N-terminus to the C-terminus;

(h) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vκ_A-Cλ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vκ_B-Cκ from the N-terminus to the C-terminus;

(i) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vλ_A-Cκ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cλ from the N-terminus to the C-terminus;

(j) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises Vλ_A-Cλ-L-VH_B-CH1 from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cκ from the N-terminus to the C-terminus;

(k) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vλ_A-Cκ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cλ from the N-terminus to the C-terminus;

(l) the first polypeptide chain comprises VH_A-CH1 from the N-terminus to the C-terminus, the second polypeptide chain comprises VH_B-CH1-L-Vλ_A-Cλ from the N-terminus to the C-terminus, and the third polypeptide chain comprises Vλ_B-Cκ from the N-terminus to the C-terminus.

9. The antigen-binding protein according to any one of claims 1-8, wherein the antigen-binding region A and the antigen-binding region B each independently bind to an antigen selected from the group consisting of: a tumor-associated antigen, an immune cell antigen such as a T cell antigen and/or an NK cell antigen, and an immune checkpoint molecule; preferably, wherein the antigen-binding region A

and the antigen-binding region B bind to two different tumor-associated antigens, or different epitopes on a same tumor-associated antigen; or wherein one of the antigen-binding region A and the antigen-binding region B binds to a tumor-associated antigen, and the other binds to an immune cell antigen, such as a T cell antigen and/or an NK cell antigen.

10. The antigen-binding protein according to claim 9, wherein the tumor-associated antigen is selected from CD19, BCMA, TSHR, CD171, CS-1, CLL-1, GD3, Tn Ag, FLT3, CD38, CD123, CD44v6, B7H3, B7H4, KIT, IL-13Ra2, IL-11Ra, PSCA, PSMA, PRSS21, VEGFR2, LewisY, CD24, PDGFR-beta, SSEA-4, MUC1, EGFR, NCAM, CAIX, LMP2, EphA2, fucosyl GM1, sLe, GM3, TGS5, HMWMAA, GD2, FOLR1, FOLR2, TEM1/CD248, TEM7R, CLDN6, CLDN18.2, GPRC5D, CXORF61, CD97, CD179a, ALK, polysialic acid, PLAC1, GloboH, NY-BR-1, UPK2, HAVCR1, ADRB3, PANX3, GPR20, LY6K, OR51E2, TAARP, WT1, ETV6-AML, SPA17, XAGE1, Tie 2, MAD-CT-1, MAD-CT-2, FOSL1, hTERT, ML-IAP, ERG, NA17, PAX3, AR, cyclin B1, MYCN, RhoC, CYP1B1, BORIS, SART3, PAX5, OY-TES1, LCK, AKAP-4, SSX2, CD79a, CD79b, CD72, LAIR1, FCAR, LILRA2, CD300LF, CLEC12A, BST2, EMR2, LY75, GPC3, FCRL5, IGLL1, CD20, CD30, HER2, ROR1, FLT3, TAAG72, CD22, CD33, GD2, gp100Tn, FAP, tyrosinase, EPCAM, CEA, IGF-1R, EphB2, mesothelin, cadherin 17, CD32b, EGFRvIII, GPNMB, GPR64, HER3, LRP6, LYPD8, NKG2D, SLC34A2, SLC39A6, SLITRK6, GUCY2C, or TACSTD2; preferably B7H3, B7H4, PSMA, CLDN18.2, GPC3, HER2, ROR1, CD22, EPCAM, mesothelin, EGFRvIII or TACSTD2; preferably, the tumor-associated antigen is selected from B7H4, PSMA, ROR1 and BCMA; and/or wherein the immune cell antigen is selected from T cell receptor (TCR), CD3, CD28, 4-1BB, OX40, GITR, CD27, ICOS, CD2, CD40, CD226, CD16, NKp30, NKp44, NKp46, NKG2D and 2B4, preferably, the immune cell antigen is CD3, CD16, or CD137.

11. The antigen-binding protein according to any one of claims 1-10, further comprising an antigen-binding region C binding to a different antigen or a different epitope on the same antigen from that of the antigen-binding region A and the

antigen-binding region B; preferably, wherein the antigen-binding region C binds to serum albumin.

12. The antigen-binding protein according to any one of claims 1-11, wherein

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 81, 99, and 117, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 35, and 58, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 82, 100, and 118, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 13, 36, and 59, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 85, 103, and 121, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 16, 39, and 62, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 82, 100, and 118, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 13, 36, and 59, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 83, 101, and 119, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 14, 37, and 60, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 82, 100, and 118, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 13, 36, and 59, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 86, 104, and 122, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as

shown in SEQ ID NO: 17, 40, and 63, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 82, 100, and 118, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 13, 36, and 59, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 84, 102, and 120, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 15, 38, and 61, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 82, 100, and 118, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 13, 36, and 59, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 81, 99, and 117, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 35, and 58, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 89, 107, and 125, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 44, and 67, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 81, 99, and 117, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 35, and 58, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 89, 107, and 125, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 45, and 67, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid

sequences as shown in SEQ ID NO: 83, 101, and 119, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 14, 37, and 60, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 89, 107, and 125, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 44, and 67, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 83, 101, and 119, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 14, 37, and 60, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 89, 107, and 125, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 45, and 67, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 84, 102, and 120, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 15, 38, and 61, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 88, 106, and 124, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 19, 42, and 65, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 84, 102, and 120, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 15, 38, and 61, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 87, 105, and 123, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 18, 41,

and 64, respectively;

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 81, 99, and 117, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 35, and 58, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 88, 106, and 124, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 19, 42, and 65, respectively; or

the VL_A comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 81, 99, and 117, respectively; the VH_A comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 12, 35, and 58, respectively; and the VL_B comprises LCDR1, LCDR2, and LCDR3 having the amino acid sequences as shown in SEQ ID NO: 87, 105, and 123, respectively; the VH_B comprises HCDR1, HCDR2, and HCDR3 having the amino acid sequences as shown in SEQ ID NO: 18, 41, and 64, respectively,

wherein the CDR sequences are defined according to Chothia numbering system.

13. The antigen-binding protein according to claim 12, wherein

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 145; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 132;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 151; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 138;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 148; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 135; the

VL_B comprises the amino acid sequence as shown in SEQ ID NO: 151; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 138;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 146; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 133; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 151; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 138;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 149; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 136; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 151; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 138;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 147; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 134; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 151; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 138;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 153; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 141;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 153; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 142;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 146; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 133; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 153; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 141;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 146; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 133; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 153; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 142;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 147; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 134; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 152; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 139;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 147; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 134; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 150; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 137;

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 152; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 139; or

the VL_A comprises the amino acid sequence as shown in SEQ ID NO: 144; the VH_A comprises the amino acid sequence as shown in SEQ ID NO: 131; the VL_B comprises the amino acid sequence as shown in SEQ ID NO: 150; and the VH_B comprises the amino acid sequence as shown in SEQ ID NO: 137.

14. The antigen-binding protein according to claim 1, wherein

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 178; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 168;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 187; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 174;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 179; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 180; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 174;

the first polypeptide chain comprises the amino acid sequence as shown in

SEQ ID NO: 181; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 182; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 174;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 183; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 184; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 174;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 185; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 186; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 174;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 188; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 176;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 189; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 176;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 181; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 190; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 176;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 181; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 191; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 176;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 185; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 193; and the third polypeptide chain comprises the amino

acid sequence as shown in SEQ ID NO: 192;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 185; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 194; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 173;

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 195; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 192; or

the first polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 177; the second polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 196; and the third polypeptide chain comprises the amino acid sequence as shown in SEQ ID NO: 173.

15. The antigen-binding protein according to any one of claims 1-14, wherein the antigen-binding protein does not comprise an antibody Fc region.

16. An isolated nucleic acid encoding the antigen-binding protein according to any one of claims 1-15.

17. A recombinant expression vector comprising the isolated nucleic acid according to claim 16;

preferably, the expression vector comprises a eukaryotic cell expression vector and/or a prokaryotic cell expression vector.

18. A host cell comprising the isolated nucleic acid according to claim 16 or the recombinant expression vector according to claim 17; preferably, the host cell is a prokaryotic cell and/or a eukaryotic cell, preferably, the prokaryotic cell is an *E. coli* cell, such as TG1 or BL21 cell, and preferably, the eukaryotic cell is an HEK293 cell or a CHO cell.

19. A pharmaceutical composition characterized in that the pharmaceutical composition comprises the antigen-binding protein according to any one of claims 1-15, and a pharmaceutically acceptable carrier;

preferably, the pharmaceutical composition further comprises one or more

additional anti-tumor agents as active ingredients.

20. An effective amount of the antigen-binding protein according to any one of claims 1-15 or the pharmaceutical composition according to claim 19 for use in preventing and/or treating a disease in a subject in need thereof; preferably, wherein the disease is cancer.

21. A preparation method for the antigen-binding protein according to any one of claims 1-20, comprising:

(a) expressing the first polypeptide chain, the second polypeptide chain, and the third polypeptide chain of the antigen-binding protein in a host cell to obtain a protein mixture assembled by the first polypeptide chain, the second polypeptide chain, and the third polypeptide chain;

(b) based on the type of the light chain constant region comprised in the second polypeptide chain of the antigen-binding protein, affinity-capturing the second polypeptide chain with a corresponding affinity chromatography method, so as to obtain the antigen-binding protein composed of the first polypeptide chain and the third polypeptide chain interacting with the second polypeptide chain, and to remove the mismatched products not containing the second polypeptide.

22. The preparation method according to claim 21, wherein the second polypeptide chain contains a Cκ region, and the antigen-binding protein is obtained with a κ-chain specific affinity chromatography method; or wherein the second polypeptide chain contains a Cλ region, and the antigen-binding protein is obtained with a λ-chain specific affinity chromatography method.