CLAIMS

1. A monomer structure comprising a polymerizing molecule and a binding-blocking molecular unit, wherein the polymerizing molecule is a peptide or a protein and has a monomer binding site and a polymerizing site, the monomer binding site is configured to bind to the binding-blocking molecular unit to form the monomer structure, and the polymerizing site is configured to mediate self-association of a plurality of the monomer structures so as to form a polymer structure;

the binding-blocking molecular units comprise a binding molecule that bind to a cell receptor or the virus, thereby enabling competitively blocking the binding of the viral to the cell receptor;

the monomer binding site is located at an N-terminus of the polymerizing molecule, and a C-terminus of the binding-blocking molecule unit is covalently linked or linked via a linker molecule to the N-terminus of the polymerizing molecule; and

the monomer structure further comprises an acidic structure; the acidic structure is a short-chain polymer of amino acids which is negatively charged, and further, the acidic structure has one or more of the following characteristics:

(1) the acidic structure is located at the C-terminus of the monomer structure;

(2) the short-chain polymer has 2 to 40 amino acid residues; and

(3) the negatively charged amino acids are aspartate and/or glutamate,

preferably, the monomer structure has a size of 30 to 80 KD.

2. The monomer structure according to claim 1, wherein the binding-blocking molecule unit blocks the binding between a virus and a cell receptor by binding to a site of the virus at which the virus binds to the cell receptor, and/or

the binding-blocking molecule unit blocks the binding between the virus and the cell receptor by binding to the cell receptor.

3. The monomer structure according to claim 1 or 2, wherein the polymerizing molecule binds to the binding-blocking molecule unit via a linker molecule;

the linker molecule comprises any one or more of a fluorescent protein, a human immunoglobulin G4, a Fc, and an HSA; for example, the linker molecule is fluorescent protein eGFP or is obtained by means of modification of the fluorescent protein eGFP, preferably by deleting some amino acids from eGFP; or

the linker molecule comprises an amino acid sequence that is identical to any one of SEQ ID NOs: 2 to 6 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to any one of SEQ ID NOs: 2 to 6, preferably obtained by deleting the amino acids at positions 1 to 228 from eGFP;

preferably, the linker molecule has an N-terminus that is linked to the binding-blocking molecule unit, and a C-terminus that is linked to the N-terminus of the polymerizing molecule.

4. The monomer structure according to any one of claims 1 to 3, wherein the binding-blocking molecule unit comprises at least one blocking molecule that blocks binding between a virus and a cell receptor;

preferably, the blocking molecule comprises an amino acid sequence that is identical to any one of SEQ ID NOs: 7 to 9 and 16 to 19 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to any one of SEQ ID NOs: 7 to 9 and 16 to 19; further, when the binding-blocking molecule unit comprises a plurality of blocking molecules, the blocking molecules are linked sequentially to each other in a direction from the N-terminus to the C-terminus; more preferably, when the binding-blocking molecule unit is linked to the polymerizing molecule via the linker molecule, the N-terminus of the linker molecule is linked to the C-terminus of the last blocking molecule, and the C-terminus of the linker molecule is linked to the monomer binding site; and

still more preferably, the blocking molecule is a nanobody.

5. The monomer structure according to any one of claims 1 to 4, the binding-blocking molecule unit comprises at least one first blocking molecule and/or at least one second blocking molecule; the first blocking molecule comprises an amino acid sequence that is identical to SEQ ID NO: 7 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to SEQ ID NO: 7, and the second blocking molecule comprises an amino acid sequence that is identical to any one of SEQ ID NOs: 8 and 16 to 19 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to any one of SEQ ID NOs: 8 and 16 to 19;

preferably, the binding-blocking molecule unit comprises two first blocking molecules or two second blocking molecules;

preferably, the two first blocking molecules or the two second blocking molecules are linked to each other respectively via a N-terminus of one to a C-terminus of the other;

preferably, the first blocking molecule is linked to the second blocking molecule by linking the N-terminus of one to the C-terminus of the other, and more preferably, the N-terminus of the second blocking molecule is linked to the C-terminus of the first blocking molecule.

6. The monomer structure according to any one of claims 1 to 5, wherein the polymerizing molecule is any one selected from Table 1.

7. The monomer structure according to any one of claims 1 to 6, wherein the polymerizing molecule comprises an amino acid sequence that is identical to SEQ ID NO: 1 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to SEQ ID NO: 1.

8. The monomer structure according to claim 2, wherein the cell receptor is ACE2.

9. The monomer structure according to any one of claims 1 to 8, wherein the monomer structure further comprises a leading peptide,

the leading peptide comprises an amino acid sequence that is identical to SEQ ID NO: 10 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to SEQ ID NO: 10; and

preferably, the leading peptide has a C-terminus that is linked to the N-terminus of any one of the blocking molecules.

10. The monomer structure according to any one of claims 1 to 9, wherein the acidic structure is linked to the C-terminus of the polymerizing molecule.

11. The monomer structure according to any one of claims 1 to 10, wherein the monomer structure further comprises a protein tag;

the protein tag comprises an amino acid sequence that is identical to SEQ ID NO: 15 or has at least 50%, 60%, 70%, 80%, 85%, 90%, 95% or 99% identity to SEQ ID NO: 15,

preferably, the protein tag has a C-terminal that is linked to the N-terminal of a binding-blocking molecule unit, and when the binding-blocking molecule unit is blocking peptide fragments, the C-terminal of the protein tag is linked to the N-terminal of any one of blocking peptide fragments; and

more preferably, when the monomer structure further comprises the leading peptide, the leading peptide is linked to the binding-blocking molecule unit via the protein tag.

12. The monomer structure according to any one of claims 2 to 11, wherein the virus is one or more of hepatitis B virus, rabies virus, HPV, and COVID-19 virus.

13. A polymer structure formed by polymerizing a plurality of the monomer structures according to any one of claims 1 to 12.

14. The polymer structure according to claim 13, wherein the polymer structure is formed by polymerizing 2 to 10 monomer structures,

preferably, the polymer structure is formed by polymerizing four monomer structures,

preferably, the blocking structure unit has a binding force that is 1000 to 1000,000 times greater than a nanobody,

preferably, wherein the polymer structure is soluble.

15. A nucleic acid encoding the monomer structure according to any one of claims 1 to 12, or the polymer structure according to claim 13 or 14.

16. A vector comprising the nucleic acid according to claim 15.

17. A eukaryotic host cell comprising the nucleic acid according to claim 15 or the vector according to claim 16.

18. Use of any one of the monomer structure according to any one of claims 1 to 12, and the polymer structure according to claim 13 or 14 in the preparation of an agent for detection of a virus, or in the preparation of a medicament for virus infection,

preferably, an unpurified product obtained by in vitro cell-free synthesis of the polymer structure is directly applied for the use.

19. A disinfection product, a cosmetic product, a skin care product, a care product, a food or a cleaning

product comprising one or more of the monomer structure according to any one of claims 1 to 12, and the polymer structure according to claim 13 or 14.

20. A medicament comprising: one or more of the monomer structure according to any one of claims 1 to 12, and the polymer structure according to claim 13 or 14; and a pharmaceutically acceptable carrier, diluent, or excipient.