burden on a subsequent impurity removal step with respect to the removal of impurities such as aggregates, and a separation technique thereof.

SOLUTIONS TO THE PROBLEMS

[0014]

As a result of intensive investigation from the viewpoint of the problems, the inventor found that each of an antibody affinity ligand and a cation exchange group (cation exchange ligand) concertedly acts by immobilizing both of the ligands on a water-insoluble carrier, thereby obtaining a separation matrix having both an adsorption ability specific to an Fc-containing target molecule such as an antibody and an excellent ability of removing impurities such as aggregates, to complete the present invention.

[0015]

Specifically, the mixed mode antibody affinity separation matrix of the present invention is a mixed mode antibody affinity separation matrix comprising an antibody affinity ligand and a cation exchange group on a single separation matrix, wherein both the antibody affinity ligand and the cation exchange group are immobilized to a separation matrix via a covalent bond, and the antibody affinity ligand is a peptide ligand or a protein ligand.

[0016]

The dynamic binding capacity of the cation exchange group under the condition of elution pH for a target molecule is preferably not more than two times of the dynamic binding capacity of the antibody affinity ligand under the condition of neutral pH.

[0017]

Further, it is preferable that the cation exchange group is attached to a separation matrix comprising an antibody affinity ligand.

[0018]

CLAIMS

1. A mixed mode antibody affinity separation matrix comprising an antibody affinity ligand and a cation exchange group on a single separation matrix, wherein both the antibody affinity ligand and the cation exchange group are immobilized to a separation matrix via a covalent bond, and the antibody affinity ligand is a peptide ligand or a protein ligand.

2. The mixed mode antibody affinity separation matrix according to claim 1, wherein the dynamic binding capacity of the cation exchange group under the condition of elution pH for a target molecule is not more than two times of the dynamic binding capacity of the antibody affinity ligand under the condition of neutral pH.

3. The mixed mode antibody affinity separation matrix according to claim 1 or 2, wherein the cation exchange group is attached to a separation matrix comprising an antibody affinity ligand.

4. The mixed mode antibody affinity separation matrix according to claim 1 or 2, wherein the antibody affinity ligand is attached to a separation matrix comprising a cation exchange group.

5. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 4, wherein the antibody affinity ligand is at least one selected from protein A, protein G, protein L, protein H, protein D, protein Arp, protein FcγR, a synthetic ligand for binding an antibody and an analog thereof.

6. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 4, wherein the antibody affinity ligand is at least one selected from protein A, protein G, protein L and an analog thereof.

7. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 4, wherein the antibody affinity ligand is at least one selected from protein A and an analog thereof.

8. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 7, wherein the cation exchange group is a ligand comprising at least one selected from a carboxyl group and a sulfate group.

9. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 8, wherein a base material of a water-insoluble carrier of the separation matrix is made from at least one selected from carbohydrate and derivatives thereof, synthetic polymers and glass.

10. The mixed mode antibody affinity separation matrix according to any one of claims 1 to 8, wherein ~~thea~~ structure of ~~thea~~ base material of the separation matrix is a porous bead, monolith or membrane.

11. A method for purifying a target molecule using the mixed mode antibody affinity separation matrix according to any one of claims 1 to 10.

12. The method according to claim 11, wherein the elution pH of the target molecule is 6 or less.

13. The method according to claim 11 or 12, wherein the elution pH of the target molecule is 2 or more.

14. The method according to any one of claims 11 to 13, wherein