sequential steps of (a) loading the composition onto a cation exchange material at a loading density of greater than about 150 g/L of cation exchange material; and (b) loading a composition recovered from the cation exchange material onto a mixed mode material; or (ii) sequential steps of (a) loading the composition onto a mixed mode material; and (b) loading a composition recovered from mixed mode material onto a cation exchange material at a loading density of greater than about 150 g/L of cation exchange material.

[0006a] In one aspect, the present disclosure refers to a method for purifying an antibody or an immunoadhesin from a composition comprising the antibody or the immunoadhesin and at least one contaminant, wherein the method comprises either (i) or (ii):

(i) sequential steps of (a) loading the composition onto a cation exchange material at a loading density of between 150 g/L and 2000 g/L of cation exchange material; and (b) loading a composition recovered from the cation exchange material onto a mixed mode material; or

(ii) sequential steps of (a) loading the composition onto a mixed mode material; and (b) loading a composition recovered from mixed mode material onto a cation exchange material at a loading density of greater than 150 g/L of cation exchange material,

wherein the antibody binds the cation exchange material and where the cation exchange material is a monolith.

[0007] In some examples of any of the methods, the polypeptide has a pI of between about 6 and about 10. In some examples, the polypeptide has a pI of between about 7 and about 9.

[0008] In some examples of any of the methods, the polypeptide is an antibody or an immunoadhesin. In some examples, the polypeptide is an immunoadhesin. In some examples, the polypeptide is an antibody. In some examples, the antibody is a monoclonal antibody. In some examples, the monoclonal antibody is a chimeric antibody, humanized antibody, or human antibody. In some examples, the monoclonal antibody is an IgG monoclonal antibody. In some examples, the antibody is an antigen binding fragment. In some examples, the antigen binding fragment is selected from the group consisting of a Fab fragment, a Fab' fragment, a $F(ab')_2$ fragment, a scFv, a Fv, and a diabody.

[0009] In some examples of any of the methods, the at least one contaminant is any one or more of Chinese Hamster Ovary Protein (CHOP), leached protein A, DNA, aggregated protein, cell culture media component, gentamicin, and viral contaminant.

[0010] In some examples of any of the methods, the sequential steps in (i) and/or (ii) are continuous. In some examples of any of the methods, the sequential steps in (i) and/or (ii) are discontinuous. In some examples of any of the methods, the method is (i). In some examples of any of the methods, the method is (ii).

[0011] In some examples of any of the methods, the loading density is between about 150 g/L and about 2000 g/L. In some examples, the density is between about 150 g/L and about 1000 g/L. In some examples, the density is between about 500 g/L and about 700 g/L

[0012] In some examples of any of the methods, the cation exchange material comprises a carboxylic acid functional group or a sulfonic acid functional group. In some examples, the functional group is sulphopropyl, sulfoethyl, sulfoisobutyl, or caboxyl. In some examples, the cation exchange material is a membrane, a monolith, or resin particles. In some examples, the cation exchange material is a resin. In some examples, the cation exchange material is Mustang S, Sartobind S, SO3 Monolith, S Ceramic HyperD, Poros HS50, Poros HS20, sulphopropyl-Sepharose Fast Flow (SPSFF), SP-Sepharose XL (SPXL), CM Sepharose Fast Flow, Capto S, Fractogel Se HiCap, Fractogel SO3, or Fractogel COO. In some examples, the cation exchange material is Poros HS50.

[0013] In some examples of any of the methods, the mixed mode material comprises functional groups capable of anionic exchange and hydrophobic interactions. In some examples, the mixed mode material is Capto-Adhere resin, MEP HyperCel resin, HEA HyperCel resin, PPA HyperCel resin, or ChromaSorb membrane. In some examples, the mixed mode material is Capto-Adhere resin.

[0014] In some examples of any of the methods, the method comprises use of an equilibration buffer, a wash buffer, and/or a loading buffer with the cation exchange material and/or anion exchange material, and the conductivity of the equilibration buffer, the wash buffer, and/or the loading buffer is between about 2 mS/cm to about 25 mS/cm. In some examples, the conductivity of the equilibration buffer, the wash buffer, and/or the loading buffer is between about 3 mS/cm and 8 mS/cm.

[0015] In some examples of any of the methods, the method comprises use of an equilibration buffer, a wash buffer, and/or a loading buffer with the cation exchange material and/or the anion exchange material, and the pH of the equilibration buffer, the wash buffer, and/or the loading buffer is between about 4.5 and about 6.5.

[0016] In some examples of any of the methods, the equilibration buffer, the wash buffer, and/or the loading buffer with the cation exchange material and/or the anion exchange material are the same. In some examples of any of the methods, the equilibration buffer, the wash buffer, and/or the loading buffer with the cation exchange material and/or the anion exchange material are the different.

[0017] In some examples of any of the methods, the method further comprising subjecting the composition comprising the polypeptide to one or more further purification steps either before or after steps (a) and (b). In some examples of any of the methods, the method further comprises recovering the purified polypeptide. In some examples of any of the methods, the method further comprises combining the purified polypeptide with a pharmaceutically acceptable carrier.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1A-D show the chromatograms using Poros HS50, SPSFF, SO3 Monolith, and Mustang S for the purification of anti-CD11a antibody.

[0019] FIG. 2 shows C/C_0 (the Mab ("monomer antibody") concentration) and C/C_0 (the Chinese Hamster Ovary Protein ("CHOP") concentration) with varying amount of the product comprising anti-CD11a antibody collected (g/L CV or MV) using SPSFF, Poros HS50, Mustang S, and SO3 monolith. C is the Mab or CHOP concentration in the collected fraction and C_0 is the Mab or CHOP concentration in the load.

[0020] FIG. 3 shows C/C_0 (Mab concentration) and C/C_0 (the high molecular weight ("HMW") concentration) with varying amount of the product comprising anti-CD11a antibody collected (g/L

WHAT IS CLAIMED IS:

1. A method for purifying an antibody or an immunoadhesin from a composition comprising the antibody or the immunoadhesin and at least one contaminant, wherein the method comprises either (i) or (ii):

(i) sequential steps of (a) loading the composition onto a cation exchange material at a loading density of between 150 g/L and 2000 g/L of cation exchange material; and (b) loading a composition recovered from the cation exchange material onto a mixed mode material; or

(ii) sequential steps of (a) loading the composition onto a mixed mode material; and (b) loading a composition recovered from mixed mode material onto a cation exchange material at a loading density of greater than 150 g/L of cation exchange material,

wherein the antibody binds the cation exchange material and where the cation exchange material is a monolith.

2. The method of claim 1, wherein the antibody or the immunoadhesin has a pI of between 6 and 10.

3. The method of claim 2, wherein the antibody or the immunoadhesin has a pI of between 7 and 9.

4. The method of any one of claims 1-3, wherein the antibody or the immunoadhesin is an immunoadhesin.

5. The method of any one of claims 1-3, wherein the antibody or the immunoadhesin is an antibody.

6. The method of claim 5, wherein the antibody is a monoclonal antibody.

7. The method of claim 6, wherein the monoclonal antibody is a chimeric antibody, humanized antibody, or human antibody.

8. The method of claim 6, wherein the monoclonal antibody is an IgG monoclonal antibody.

9. The method of claim 5, wherein the antibody is an antigen binding fragment.

10. The method of claim 9, wherein the antigen binding fragment is selected from the group consisting of a Fab fragment, a Fab' fragment, a $F(ab')_2$ fragment, a scFv, a Fv, and a diabody.

11. The method of claim 6, wherein the antibody is an anti-CD20 antibody, an anti-CD11a antibody or an anti-VEGF antibody.

12. The method of any one of claims 1-11, wherein the at least one contaminant is any one or more of Chinese Hamster Ovary Protein (CHOP), leached protein A, DNA, aggregated protein, cell culture media component, gentamicin, and viral contaminant.

13. The method of any one of the proceeding claims, wherein the sequential steps in (i) and/or (ii) are continuous.

14. The method of any one of claims 1-13, wherein the method is (i).

15. The method of any one of claims 1-13, wherein the method is (ii).

16. The method of claim 15, wherein the loading density is between 500 g/L and 1000 g/L of cation exchange material.

17. The method of any one of claims 1-16, wherein the cation exchange material comprises a carboxylic acid functional group or a sulfonic acid functional group.

18. The method of claim 17, wherein the functional group is sulphopropyl, sulfoethyl, sulfoisobutyl, or caboxyl.

19. The method of any one of claims 1-16, wherein the cation exchange material is SO3 Monolith.

20. The method of any one of claims 1-19, wherein the mixed mode material comprises functional groups capable of anionic exchange and hydrophobic interactions.

21. The method of claim 20, wherein the mixed mode material is Capto-Adhere resin, MEP HyperCel resin, HEA HyperCel resin, PPA HyperCel resin, or ChromaSorb membrane.

22. The method of any one of claims 1-21, wherein the method comprises use of an equilibration buffer, a wash buffer, and/or a loading buffer with the cation exchange material and/or mixed mode material, and the conductivity of the equilibration buffer, the wash buffer, and/or the loading buffer is between 2 mS/cm to 25 mS/cm.

23. The method of claim 22, wherein the conductivity of the equilibration buffer, the wash buffer, and/or the loading buffer is between 3 mS/cm and 8 mS/cm.

24. The method of any one of claims 1-23, wherein the method comprises use of an equilibration buffer, a wash buffer, and/or a loading buffer with the cation exchange material and/or the mixed mode material, and the pH of the equilibration buffer, the wash buffer, and/or the loading buffer is between 4.5 and 6.5.

25. The method of any one of claims 22-24, wherein the equilibration buffer, the wash buffer, and/or the loading buffer with the cation exchange material and/or the mixed mode material are the same.

26. The method of any of the preceding claims further comprises subjecting the composition comprising the antibodies or the immunoadhesins to one or more further purification steps either before or after steps (a) and (b).

27. The method of any of the preceding claims further comprising recovering the purified antibody or the immunoadhesin.

28. The method of claim 27 further comprising combining the purified antibody or immunoadhesin with a pharmaceutically acceptable carrier.