What is claimed is:

1. A method of cleaning a chromatography medium for reuse, comprising:

loading a composition comprising a protein and at least one impurity onto the chromatography medium, wherein the loading density exceeds the dynamic binding capacity of the chromatography medium for the protein;

collecting fractions comprising the protein; and

cleaning the chromatography medium using a linear salt gradient.

2. The method of claim 1, wherein the chromatography medium is a cation exchange (CEX) chromatography resin and is packed in a chromatography column.

3. The method of any one of claims 1 to 2, wherein the loading density is at least 500 g/L-r.

4. The method of any one of claims 1 to 3, wherein the loading density is in the range of 1000 g/L-r to 1500 g/L-r.

5. The method of any one of claims 1 to 4, wherein the chromatography medium is loaded at or near saturation with the at least one impurity.

6. The method of any one of claims 1 to 5, wherein the at least one impurity comprises one or more high molecular weight species of the protein.

7. The method of any one of claims 1 to 6, wherein the linear salt gradient comprises an increase in salt concentration from less than 50 mM to 500 mM.

8. The method of any one of claims 1 to 7, wherein the linear salt gradient comprises an increase in salt concentration from 0 mM to 350 mM.

9. The method of any one of claims 1 to 8, wherein the linear salt gradient is an NaCl gradient, a KCl gradient, a $CaCl_2$ gradient, or an Na_2SO_4 gradient.

10. The method of any one of claims 1 to 9, wherein the linear salt gradient is an NaCl gradient.

11. The method of any one of claims 1 to 10, wherein the linear salt gradient is generated using at least two buffers, wherein each of the at least two buffers used to generate the linear salt gradient is independently selected from acetate buffers, phosphate buffers, Tris buffers, and 2-(N-morpholino)ethanesulfonic acid buffers.

12. The method of claim 11, wherein each of the at least two buffers used to generate the linear salt gradient comprises acetate.

13. The method of claim 11 or claim 12, wherein the pH of each of the at least two buffers used to generate the linear salt gradient is greater than 3.6 and less than 5.6.

14. The method of any one of claims 1 to 10, wherein the linear salt gradient is generated by Buffer A and Buffer B, wherein Buffer A comprises 50 mM acetate and 0 mM or 20 mM sodium chloride at a pH value of 5.0± 0.1 and Buffer B comprises 50 mM acetate and 500 mM sodium chloride at a pH value of 5.0± 0.1.

15. The method of any one of claims 1 to 14, wherein the slope of the linear salt gradient is less than or equal to 0.07 M salt/medium volume buffer.

16. The method of any one of claims 1 to 15, wherein the gradient length is at least 7 medium volumes.

17. The method of any one of claims 1 to 16, wherein the cleaning using the linear salt gradient is non-denaturing.

18. The method of claim 17, wherein the denaturing solution comprises sodium hydroxide.

19. The method of any one of claims 1 to 18, wherein the method enables reuse of the chromatography medium for at least 25 cycles.

20. A method for purifying a protein from a composition comprising the protein and at least one impurity, comprising:

equilibrating a chromatography medium using an equilibration buffer;

loading the composition comprising the protein and the at least one impurity onto the chromatography medium in frontal mode at a loading density of at least 500 g/L-r;

collecting fractions comprising the protein;

passing less than 2 medium volumes of a post-load wash solution through the chromatography medium and adding the eluate to the fractions;

cleaning the chromatography medium using a linear salt gradient; and

cleaning the chromatography medium using a denaturing solution.

21. The method of claim 20, wherein fraction collection begins at an optical density of 0.5 at 280 absorbance and is stopped after less than or equal to one medium volume of the post-load wash solution is passed through the chromatography medium.

22. The method of any one of claims 20 to 21, wherein the equilibration buffer does not contain salt.

23. The method of any one of claims 20 to 22, wherein the denaturing solution is an used in an isocratic cleaning process.

24. The method of any one of claims 20 to 23, wherein the chromatography medium is a cation exchange (CEX) chromatography resin and is packed in a chromatography column.

25. A method for improving step yield for a frontal chromatography operation, comprising:

estimating an amount of a protein in a load solution; and

determining a bed height for a frontal chromatography medium based on a target residence time, wherein the flow rate is a constant value in the range of 50 cm/hr to 250 cm/hr.

26. A method for improving step yield for a frontal chromatography operation, comprising:

estimating an amount of a protein in a load solution; and

determining a flow rate for the frontal chromatography operation based on a target residence time, wherein the flow rate is in the range of 50 cm/hr to 250 cm/hr and a bed height for a frontal chromatography medium is a constant value in the range of 5 cm to 30 cm.