Polystyrene Based Ion-Exchange Resins For Protein Bioseparation In a Novel Fluidized System

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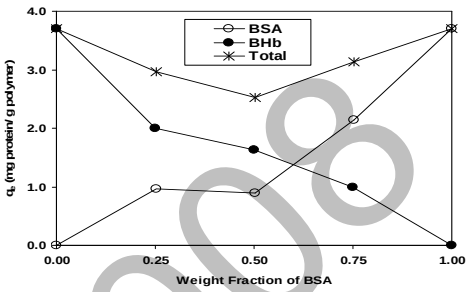
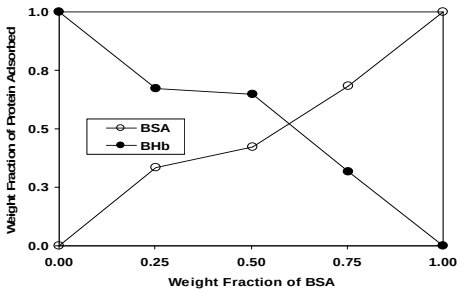
Abstract

rotein bioseparation experiments demonstrated unique behaviour of this airlift bioreactor in protein bioseparation onto a PS based anion exchange resin. Surprisingly, bioseparation of proteins was achieved from solutions containing both BSA and BHb at different initial concentrations and at pH=7. Similar Adsorption capacities of both proteins were observed in single protein adsorption experiments at pH=7, as negatively charged BSA adsorb through electrostatic forces. Compressibility of BHb allowed for high adsorption capacity, in addition to the hydrophobic interaction forces.

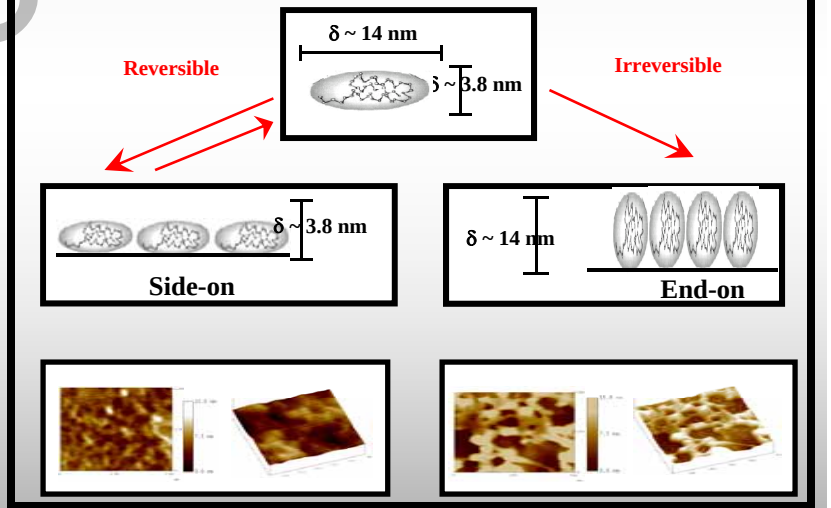
Protein Bioseparation



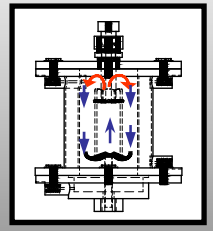


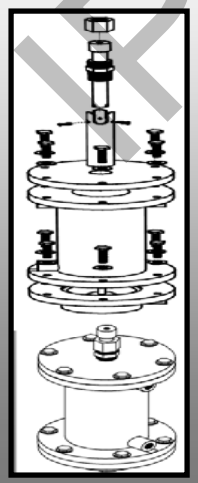
Protein Model System

	BSA	*BHb*
Molecular Weight (Da)	67,000	68,000
Hydrodynamic Dimensions (nm)	14 x 4 x 4	7 x 5.5 x 5.5
Equivalent Radius (nm)	3.61	3.10
Isoelectric pH	4.7	7.1



Fluidized Bioreactor





Liquid Inlet.
Liquid Outlet.
Cooling Jacket Outlet.
Cooling Jacked Inlet.
Liquid Level.
Sampling Port.
Flanges.
Liquid Jets (connected to the screen base).
Supporting shaft for the double – draft tubes (all removable).
Water manometer taps.
Perforated screen.

Conclusion

Bioseparation adsorption experiments were conducted from solutions containing binary mixtures of BSA and BHb at different initial concentrations. Although both BSA and BHb has similar equivalent radius, the higher adsorption of BHb observed was explained by the high compressibility of this soft protein under high shear environments. Using the airlift bioreactor, this seems not to happen. Furthermore, adsorption experiments from binary solution of BSA initial concentration fractions of higher than 0.5 showed accordingly preferential adsorption of BSA. Apparently the homogeneous field of lower shear offered by the airlift bioreactor reduced compressibility of BHb.