NOVEL TECHNOLOGY FOR USE IN PROTEIN PURIFICATION

Yu-Kaung Chang

Department of Chemical Engineering & Graduate School of Biochemical Engineering &

Center for Biochemical Engineering, Ming Chi University of Technology,

84 Gungjuan Rd., Taishan, Dist. New Taipei City 24301, Taiwan

E-mail: ykchang@mail.mcut.edu.tw

Abstract

Expanded and fluidized bed adsorption have been employed as an integrated technology for combining clarification, concentration and initial purification in a single step. The protein can be recovered directly from the particulate-containing feedstock, such as the fermentation broth and preparations of disrupted cells, without the need for prior removal of the suspended solids, which normally leads to blockage of the packed bed. The adoption of this technology will greatly reduce the complexity of downstream processing by eliminating some of the filtration, centrifugation and concentration steps. Some important factors that are critical to the success of a procedure include the correct choice of adsorbent and the careful design of the apparatus in which the separation is performed. The design, optimization and scale-up of appropriate operating protocols for expanded bed procedures are very similar to those used for the operation of packed beds. The basics and implementation of expanded-bed chromatography, its advantages as well as problems encountered in the use of this technique for the direct extraction of proteins from unclarified feedstocks are addressed. The basic principles and implementation of expanded/fluidized bed chromatography, its advantages as well as problems encountered in using this technique for the direct extraction of proteins from unclarified feedstocks are discussed. A newly designed stirred fluidized bed column for use in direct recovery of proteins from highly viscous feedstock is also discussed.

Membrane chromatography has been widely used in protein purification and medical applications. Membranes as a carrier matrix have considerable advantages over the conventional adsorbent bead supports because they are incompressible and eliminate diffusion limitations. As a result, higher throughput and faster processing times are possible in membrane chromatography. Polymer nanofibers made by electrospinning are useful as efficient membrane materials for protein purification because of their light weight, high surface area, and porous structure. Electrospun nanofibers not only can form high-porosity membranes with controlled pore sizes, but also can be functionalized to enhance the purification performance. Various composite membrane formats containing nanofibers in different arrangements have been demonstrated successfully for protein purification. The prospect of further development of nanofiber membrane will be discussed.

Keywords*: Expanded bed adsorption, Stirred fluidized bed adsorption, Nanofiber membrane chromatography*