

Lan QD, Ph.D., "Development of a Continuous Ion Exchange System for Protein Recovery Using Liquid-Solid Circulating Fluidized Bed", The University of Western Ontario, March 2001 (co-supervised, A Bassi as chief advisor).

### **Abstract**

A liquid-solid circulating fluidized bed continuous ion exchange system (LSCFB) has been constructed and applied for the first time for the continuous recovery of bovine serum albumen (BSA) and whey proteins from unclarified broths using Diaion HPA25 anion exchanger. Under the optimal operating conditions, up to 80% of total protein was removed from the whey feed stream and an overall recovery of approximately 78% was achieved with a throughput of 8.16 g protein/hr×(kg particles). In the case of BSA recovery, up to 98% BSA was adsorbed in the downcomer and an overall protein recovery of up to 84% was obtained in the LSCFB system.

Studies regarding the hydrodynamics in the LSCFB, the kinetics and equilibrium characteristics of protein adsorption onto ion exchangers in finite baths, and continuous protein ion exchange in the LSCFB have been conducted under various operating conditions. A Langmuir-based model has been proposed and established to account for the influence of ionic strength on the capacity and the affinity of the protein adsorption onto ion exchange/affinity adsorbents. Mathematical models for the continuous protein recovery in the LSCFB were also developed and proven to be a useful tool in providing guidelines for the optimization of the system.