Membrane Cascade-Based Separation

INVENTORS • Edwin Lightfoot, Michael Cockrem

WARF: P06389US
View U.S. Patent No. 8,152,999 in PDF format.

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a counter flow cascade system that features a novel separation technique.

OVERVIEW

Purification and separation are the most expensive steps in manufacturing modern biologicals, which include soluble proteins, nucleic acids, viruses and small molecules.

THE INVENTION

UW-Madison researchers have developed a counter flow cascade system that features a novel separation technique designed to reduce the cost of manufacturing high-value biological materials. The technique promises to substantially reduce capital and operating costs and is an improvement over current separation processes, including process scale chromatography and simulated moving beds.

This system consists of a linear combination of modules forming what is known as a counterflow cascade. Each module consists of a semipermeable membrane through which the solution to be separated is passed. A diafiltration membrane that is selectively permeable to a first solute divides the solution into a permeate flow containing the first solute, and a retentate flow containing a second solute. After passing through the diafilter, the permeate flow passes through an ultrafiltration membrane, which allows only the solvent to pass through. The ultrafilter removes excess solvent from the permeate flow and recycles it back into the system.

Each module after the first accepts a mixed flow stream formed by combining the retentate flow and permeate flow from different stages. The flow rates are adjusted so that the first and second solutes are present in the same molar ratio in the mixed flow stream.
APPLICATIONS

- Useful to companies producing high-value biological materials, including soluble proteins, nucleic acids, viruses and small molecules
- Additional applications may one day include fractionating proteins from milk and other dairy products, and even the production of high fructose syrups from sucrose (cane sugar).

KEY BENEFITS

- Expected to reduce capital and operating costs
- Particularly well suited to the production of monoclonal antibodies, which will be needed in larger volumes than presently produced therapeutic proteins
- Diafiltration-ultrafiltration design facilitates separation of solute fractions and solvent management.
- Modules are combined to form a counter flow cascade separation system capable of operation approaching an ideal counter flow cascade.
- Can be operated in batch mode
- Solutes and solvents may be in vapor phase.
- An additional species, such as a colloidal, nano- or micro-particle, may be added to the mixture to retard permeation of the first or second solute.
- An electrodiffusion device may be used to selectively transport the first solute.

ADDITIONAL INFORMATION

Tech Fields
Research Tools - Synthesis & purification

CONTACT INFORMATION

For current licensing status, please contact Mark Staudt at mstaudt@warf.org or 608-960-9845.