Remove biopharmaceutical process contaminants with Dow resins

New resin kits enable rapid screening of resin chemistries

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INTRODUCTION

It can be frustrating. During a purification campaign, biopharmaceutical process chromatography columns can become contaminated with a variety of protein and non-protein species.
Some common chromatographic contaminants include residual proteins, nucleic acids, lipids, surfactants/detergents, endotoxins, viruses, bacteria, metal ions and colour bodies. The consequences of column contamination with these species include an increase in backpressure, loss of yield and purity and media discoloration.
Additionally, decreased column performance requires more frequent replacement of the column media, increasing costs and the need for validation and reducing productivity.

IMPROVING PROCESS ECONOMICS WITH DOW WATER & PROCESS SOLUTIONS GUARD RESINS

To improve your purification campaign results, consider using AMBERLITE™ and DOWEX™ polymeric resins as upstream guard resins to remove feed stream contaminants that would otherwise foul process chromatography columns. These resins, from Dow Water & Process Solutions, are flexible enough to be used in either batch or column operations, thus reducing capital costs. While extremely robust, they are also economical enough to be considered single-use products, alleviating the need for validation.
As an aid for resin selection, Dow Water & Process Solutions has recently introduced new guard resin kits containing a variety of AMBERLITE™ and DOWEX™ resins, enabling rapid screening of different resin chemistries for optimal results. Several application examples with these resins are presented below.

GUARD COLUMN EXAMPLE APPLICATIONS

Colour removal

While "colour" in a biopharmaceutical process stream can be derived from a variety of different sources, the two major sources are:

- The fermentation from which the product, or a bulk intermediate, is derived. Those fermentation-derived "colours" tend to be similar to those encountered during the processing of sugar and are usually large molecules.
- Those derived from degradation products tend to differ based on the type of product being studied. The molecular weight of these degradation products varies greatly but tends to have a carboxylic functionality which is commonly present in products such as antibiotics, etc.

In Figure 1, 10mL of an *E. coli*-expressed, 75kDa protein solution was added to each tube. One gram of either AMBERLITE™ FPA53Cl, AMBERLITE™ FPA40Cl, AMBERLITE™ FPA90Cl or AMBERLITE™ FPA98Cl anion exchange resins were added to the tubes. The tubes were gently shaken to mix the resin with the sample for 30 minutes. The resins were then allowed to settle and the supernatant was carefully collected for the analysis. The untreated and treated tubes demonstrate the reduction in colour.

Surfactant/Detergent removal

Surfactants play a role in a wide range of applications, such as solubilization of membrane and viral envelope proteins, viral inactivation, and drug delivery and formulation in the pharmaceutical and cosmetic industries. Surfactant removal techniques, such as gel filtration or dialysis, have been used extensively in the

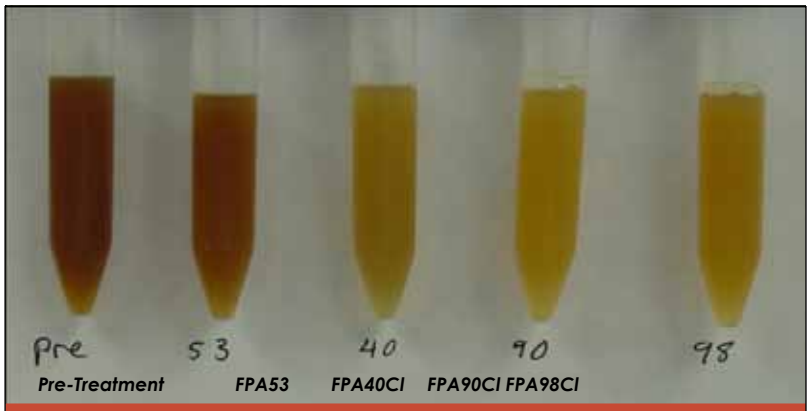

Figure 1. Colour removal using Amberlite™ FPA anion exchange resins.

biopharmaceutical industry. However, they suffer from disadvantages such as potential dilution of the protein and limited effectiveness when dealing with detergents with low critical micelle concentrations (CMCs). In biopharmaceutical purifications, membrane protein reconstitution into lipid vesicles has been accomplished by removing detergent using adsorbents such as AMBERLITE™ FPX66 (1-3). Additionally, purification of monoclonal antibodies with synthetic protein A ligands requires the use of Pluronic® F-68 detergent (4). The Pluronic detergent can be successfully removed from the Mab solution in a flow-through mode, using AMBERCHROM™ CG161 reversed phase resin.

Figure 2 demonstrates the effectiveness of AMBERLITE™ FPX66 resin used in batch mode to remove a zwitterionic detergent, CHAPS, from a BSA solution. In the example, 0.1g of resin was added to a 20mL solution containing 1 percent of CHAPS with 5g/L of BSA. The samples were shaken for 2, 4 and 6 hours and then filtered and analyzed using reversed phase HPLC. The resin was effective in removing 80 percent of the detergent while not affecting the protein recovery.

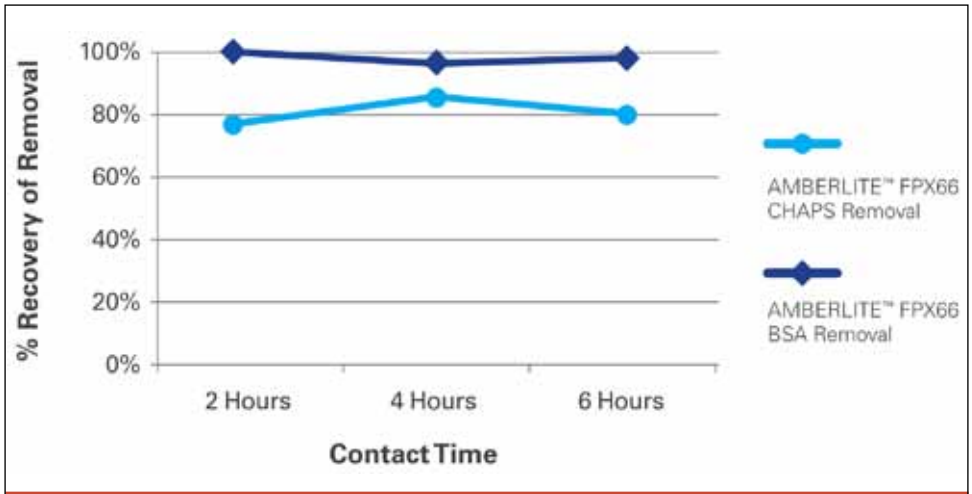

Figure 2. Removal of Zwitterionic detergent from BSA using AMBERLITE™ FPX66 resin.

BETTER RESULTS, LOWER COSTS

Time-tested and reliable Amberlite™ and Dowex™ resins from Dow Water and Process Solutions can provide laboratories with an efficient and economical means of reducing chromatographic contaminants and increasing overall productivity and profitability. Contact Dow to learn further how our solutions can help improve your workflow and work results.

REFERENCES AND NOTES

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