AMBERLITE™ XAD™16N

Industrial Grade Polymeric Adsorbent

Introduction

AMBERLITE XAD16N is a polymeric adsorbent supplied as insoluble white beads. It is a nonionic, hydrophobic, cross-linked polymer which derives its adsorptive properties from its patented macroreticular structure (containing both a continuous polymer phase and a continuous pore phase), high surface area, and the aromatic nature of its surface (see figure 1). AMBERLITE XAD16N polymeric adsorbent issued to adsorb hydrophobic molecules from polar solvents and volatile organic compounds from vapor streams. Its characteristic pore size distribution makes AMBERLITE XAD16N polymeric adsorbent an excellent choice for the adsorption of organic substances of relatively low to medium molecular weight. It can be used in column or batch operations.

Properties

Matrix	Macroreticular aliphatic cross-linked polymer
Physical form	White translucent beads
Moisture holding capacity	62 to 70 %
Shipping weight	720 g/L
Specific gravity	1.015 to 1.025
Particle size	
Harmonic mean size	0.56 - 0.71 mm
Uniformity coefficient	≤ 2.0
Fines content (0.212 mm)	< 0.350 mm : 2.0 % max
Coarse beads	> 1.18 mm : 2.0 % max.
Maximum reversible swelling	see Table 1
Surface area	≥ 800 m^2/g
Porosity	≥ 0.55 ml/ml

Suggested Operating Conditions

pH range	0 - 14
Maximum temperature limit	150°C
Minimum bed depth	75 cm (Capture)
Flow rate	
Loading	2 to 16 BV*/h
Displacement	1 to 4 BV/h
Regeneration	1 to 4 BV/h
Rinse	2 to 16 BV/h

** BV (Bed Volume) = 1 m^3 solution per m^3 resin*

Figure 1 : Chemical structure of AMBERLITE XAD16N polymeric adsorbent

Figure 2 : Pore distribution of AMBERLITE XAD16N polymeric adsorbent

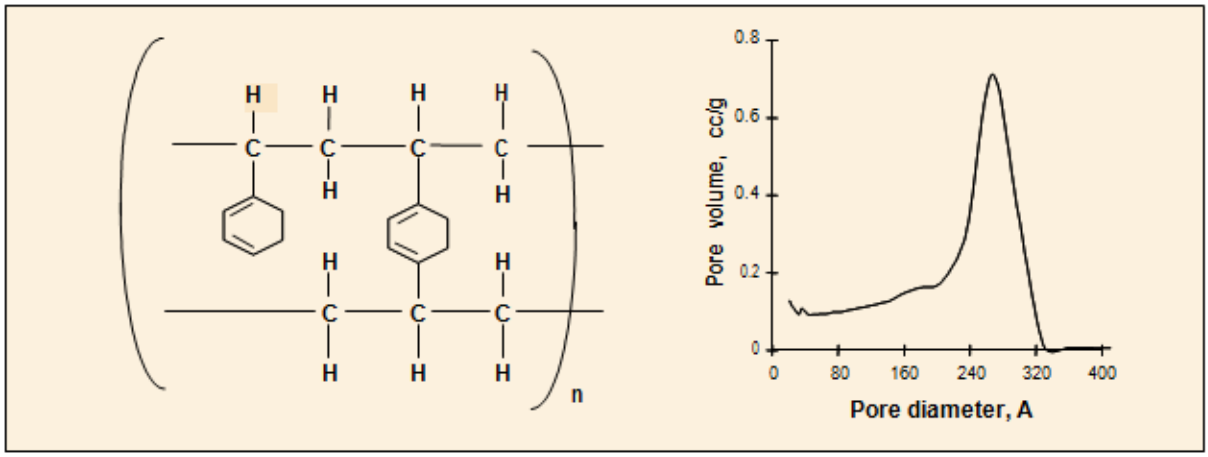


Figure 3 : Infrared Spectrum of Amberlite XAD16N polymeric adsorbent

Table 1: Percent swelling of AMBERLITE XAD 16N polymeric adsorbent in various solvents (Water: Solvent)

Solvent	% increase from as-received volume
Methanol	15
2-propanol	15
Acetone	20
p-Xylene (via methanol)	25

Pretreatment

AMBERLITE XAD16N polymeric adsorbent is shipped as a water wet product imbibed with sodium chloride (NaCl) and sodium carbonate (Na2CO3) salts to retard bacterial growth. These salts must be washed from the adsorbent prior to use and it is suggested that this be achieved by washing with water at a linear flowrate of 5-10 m/h until the required level is achieved. In some sensitive applications, residual monomeric or oligomeric compounds may be required to be removed from the adsorbent. A regeneration with the proposed regenerant is also recommended prior to beginning the first service cycle. If the regenerant is an alcohol, it must be displaced with water prior to beginning the first loading cycle.

Sample preparation for testing

Samples of Amberlite XAD16N polymeric adsorbent must be pre-treated prior to laboratory testing to ensure proper results. Please refer to Rohm and Haas publication IE-245 "Laboratory Column Procedures and Testing of Amberlite and Duolite Polymeric Adsorbents", section "Preparation of Resins".

Applications

Recovery and purification of antibiotics, water soluble steroids, enzymes , amino acids and proteins.
AMBERLITE XAD16N can be considered as a general purpose resin for these types of applications combining good mesoporosity with high surface area. In these types of applications, of which the recovery of Cephalosporin C is perhaps the best example, the loading and elution flowrates are relatively low (0.5-2 BV/h). The pH of the solution has a significant effect on the loading and elution and as the feed is often derived from a fermentation, the regeneration tends to be aggressive - 4% NaOH at elevated temperatures and solvents. A primary concern in this type of application is the separation of two or more similar solutes. In these cases, the engineering is a key point to consider during both scale and final plant design.

Removal of non polar compounds, such as phenol, from polar solvents.
These types of applications can be considered a simple capture step where the adsorbent resin is used to remove a small number of solutes from a process stream, often a waste stream. AMBERLITE XAD16N will prove useful in this type of application where the size of the solute is relatively large (> 200 D) and where the operating capacity on AMBERLITE XAD4 may be lower.

Fruit juice upgrading.
For this application, AMBERLITE XAD16HP is specifically recommended.

Regenerants/ Eluting agents

- Water miscible organic solvents (methanol, ethanol, acetone, isopropanol, etc.) for hydrophobic compounds,
- Pure solvents for regenerating resin fouled by oils and antifoams,
- Dilute bases (0.1 - 0.5% NaOH) for eluting weakly acidic compounds,
- Concentrated bases (2-4% NaOH) for regenerating resins fouled with proteins, peptides,
- Dilute acids (0.1 - 0.5% HCl) for weakly basic compounds,
- Dilute oxidising agents (< 0.5%) such as peroxide to enhance the removal of protein fouling,
- Buffer elution for pH sensitive compounds,
- Water where adsorption is from an ionic solution,
- Hot nitrogen or steam for volatile materials.

FDA Clearance

Amberlite XAD16N polymeric adsorbent has clearance under FDA Food Additive Regulation 21CFR173.65-Divinylbenzene Copolymer. The product may be used for the removal of organic substances from aqueous foods under the prescribed conditions outlined in 21CFR173.65.

Hydraulic Characteristics

Figure 4 shows the bed expansion of AMBERLITE XAD16N as a function of backwash flow rate and water temperature. Figure 5 shows the pressure drop for AMBERLITE XAD16N, as a function of service flow rate and water temperature. Pressure drop data are valid at the start of the service run with a clear water and a correctly classified bed.

Figure 4 : Bed Expansion

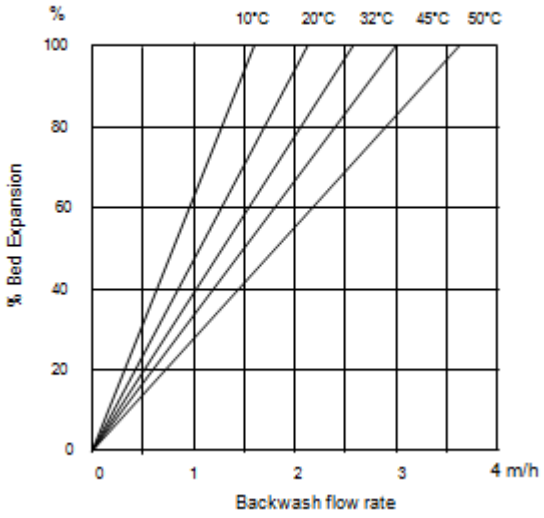
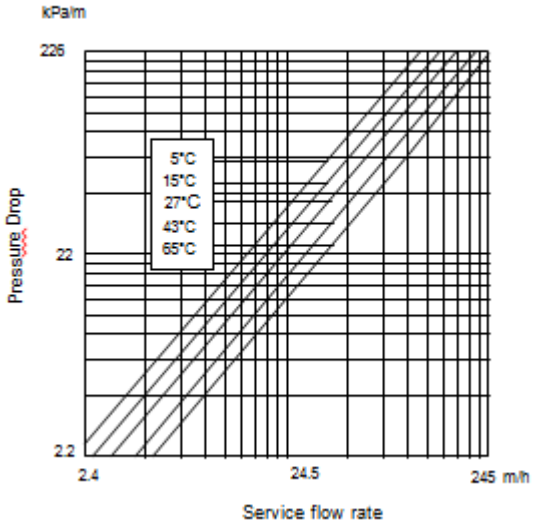


Figure 5 : Pressure Drop



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