

**AmberLite™ XAD™16N Polymeric Adsorbent**

Macroporous, Adsorbent Resin

**Description**

AmberLite™ XAD™16N Polymeric Adsorbent is supplied as white insoluble beads. It is a nonionic, hydrophobic, crosslinked polymer which derives its adsorptive properties from its macroporous structure (containing both a continuous polymer phase and a continuous pore phase), high surface area, and the aromatic nature of its surface (Figure 1). AmberLite™ XAD™16N polymeric adsorbent can be used to adsorb hydrophobic molecules from polar solvents and volatile organic compounds from vapor streams. Its characteristic pore size distribution makes AmberLite™ XAD™16N 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.

**Applications**

- Recovery and purification of antibiotics, water-soluble steroids, enzymes, amino acids, and proteins
- Removal of non-polar compounds, such as phenol, from polar solvents

## Typical Properties

### Physical Properties

Matrix	Macroporous, crosslinked DVB
Type	Adsorbent
Functional Group	None
Physical Form	White, opaque, spherical beads

### Nitrogen BET

Surface Area	~800 m <sup>2</sup> /g
Average Pore Diameter	~150 Å
Total Pore Volume	~0.6 mL/mL

### Chemical Properties

Ionic Form as Shipped	Not applicable
Total Exchange Capacity	Not applicable
Water Retention Capacity	62 – 70%

### Particle Size §

Particle Diameter	560 – 710 µm
< 300 µm	≤ 2.0%
> 1180 µm	≤ 2.0%

### Swelling (in solvent)

Methanol	15%
2-Propanol	15%
Acetone	20%
p-Xylene (via methanol)	25%

### Density

Particle Density	1.015 – 1.025 g/mL
Shipping Weight	650 g/L

§ For additional particle size information, please refer to the [Particle Size Distribution Cross Reference Chart](#) (Form No. 45-D00954-en).

Figure 1: Chemical Structure

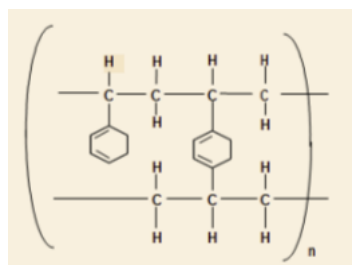


Figure 2: Pore Distribution

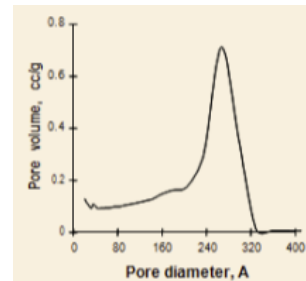
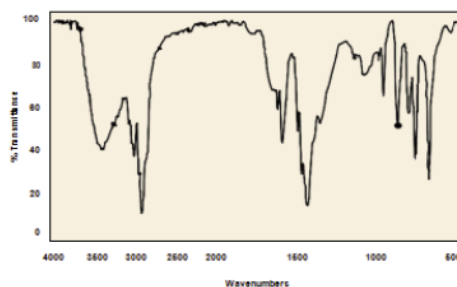


Figure 3: Infrared Spectrum



## Suggested Operating Conditions

Maximum Operating Temperature	150°C (302°F)
Bed Depth, min.	
Capture	760 mm (2.5 ft)
Flowrates	
Loading	2 – 16 BV*/h
Elution/Desorption	1 – 4 BV/h
Regeneration	1 – 4 BV/h
Rinse	2 – 16 BV/h
Regenerants or Eluting Agents	<ul style="list-style-type: none"> <li>• Water-miscible organic solvents (methanol, ethanol, isopropanol, acetone, etc.) for hydrophobic compounds</li> <li>• Pure solvents for regenerating resin fouled by oils and antifoams</li> <li>• Dilute bases (0.1 – 0.5% NaOH) for eluting weakly acidic compounds</li> <li>• Concentrated bases (2 – 4% NaOH) for regenerating resins fouled with proteins, peptides</li> <li>• Dilute acids (0.1 – 0.5% HCl) for weakly basic compounds</li> <li>• Dilute oxidizing agents (&lt; 0.5%) such as peroxide to enhance the removal of protein fouling</li> <li>• Buffer elution for pH-sensitive compounds</li> <li>• Water when adsorption is from an ionic solution</li> <li>• Hot nitrogen or steam for volatile materials</li> </ul>

\* 1 BV (Bed Volume) = 1 m<sup>3</sup> solution per m<sup>3</sup> resin or 7.5 gal per ft<sup>3</sup> resin

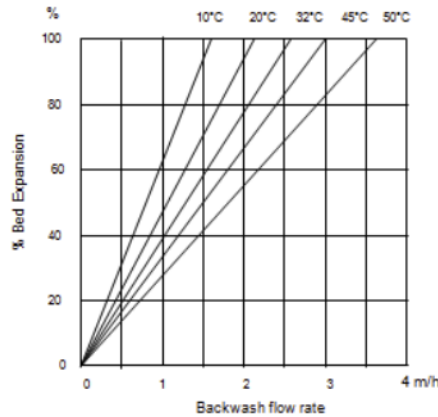
## Hydraulic Characteristics

Estimated bed expansion of AmberLite™ XAD™ 16N Polymeric Adsorbent as a function of backwash flowrate and temperature is shown in Figure 4.

Estimated pressure drop for AmberLite™ XAD™ 16N as a function of service flowrate and water temperature is shown in Figure 5. These pressure drop expectations are valid at the start of the service run with clean feed and a well-classified bed.

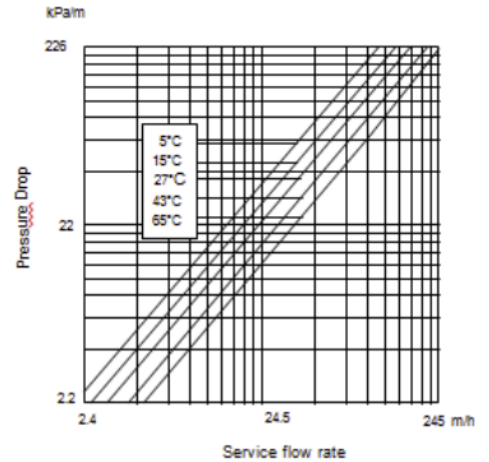
**Figure 4: Backwash Expansion**

Temperature = 10 – 50°C (50 – 122°F)



**Figure 5: Pressure Drop**

Temperature = 5 – 65°C (41 – 149°F)



## Application Information

### Pretreatment

AmberLite™ XAD™ 16N Polymeric Adsorbent is shipped as a water-wet product imbibed with sodium chloride (NaCl) and sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) salts to inhibit 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.

## Applications

### Recovery and purification of antibiotics, water-soluble steroids, enzymes, amino acids, and proteins

AmberLite™ XAD™ 16N Polymeric Adsorbent 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, since 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 pilot-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 in which the adsorbent resin is used to remove a small number of solutes from a process stream, often a waste stream. AmberLite™ XAD™ 16N Polymeric Adsorbent will be useful in this type of application in which the size of the solute is relatively large (> 200 Da) and when the operating capacity AmberLite™ XAD™ 4 Polymeric Adsorbent may be lower.

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Please be aware of the following:

- **WARNING:** Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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