Product Data Sheet

# AmberLite™ XAD™1600N Polymeric Adsorbent

Macroporous, Adsorbent Resin

## Description

AmberLite™ XAD™1600N Polymeric Adsorbent is supplied as white, insoluble beads in the fully hydrated form. The resin is designed for applications in which the separation of two or more similar species is required.

AmberLite™ XAD™1600N offers high surface area and controlled pore size like other AmberLite™ XAD™ resins, but also has all the benefits of a closely controlled particle size to give an extra dimension to the problem of chromatographic separation on the industrial scale. The particle size chosen is a balance between the smaller particle size required to achieve separation and the hydraulic limitations of using such a resin on the industrial scale. While this adsorbent resin could be used in a batch operation, the principal applications are in columnar operations.

AmberLite™ XAD™1600N has excellent physical and thermal stability in addition to a low swelling between solvent and aqueous media.

## Applications

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



Form No. 45-D00778-en, Rev. 2
January 2020

## Typical Properties

| | |
|---|---|
| **Physical Properties** | |
| Matrix | Macroporous, crosslinked DVB |
| Type | Adsorbent |
| Functional Group | None |
| Physical Form | White, opaque, spherical beads |
| **Nitrogen BET** | |
| Surface Area | ~800 $m^2/g$ |
| Average Pore Diameter | ~150 Å |
| Total Pore Volume | ~1.4 mL/mL |
| **Chemical Properties** | |
| Ionic Form as Shipped | Not applicable |
| Total Exchange Capacity | Not applicable |
| Water Retention Capacity | 66 – 73% |
| **Particle Size** [§] | |
| Particle Diameter | 400 ± 50 µm |
| Uniformity Coefficient | ≤ 1.25% |
| < 212 µm | ≤ 0.5% |
| **Swelling (in solvent)** | |
| Methanol | 15 – 20% |
| 2-Propanol | 15 – 20% |
| Acetone | 15 – 20% |
| **Density** | |
| Particle Density | 1.015 – 1.025 g/mL |
| Shipping Weight | 660 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**

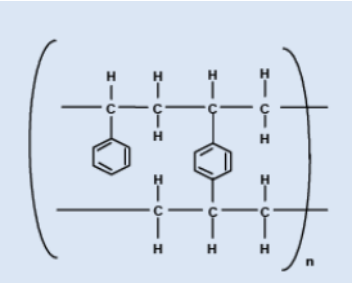


**Figure 2: Pore Distribution**

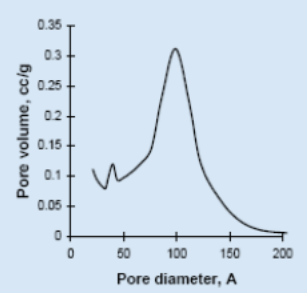
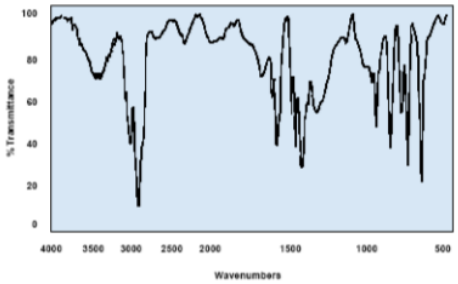



**Figure 3: Infrared Spectrum**



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## Suggested Operating Conditions

| | |
|---|---|
| Maximum Operating Temperature | 150°C (302°F) |
| pH Range (Stable) | 1 – 14 |
| Bed Depth, min. | |
| Chromatography | 1500 mm (4.9 ft) |
| Flowrates | |
| Loading | 1 – 4 BV*/h (usually) |
| Elution/Desorption | 1 – 4 BV/h |
| Regeneration | 1 – 4 BV/h |
| Rinse | 1 – 8 BV/h |
| Regenerants or Eluting Agents | • Water-miscible organic solvents (methanol, ethanol, isopropanol, acetone, etc.) for hydrophobic compounds<br>• Pure solvents for regenerating resin fouled by oils and antifoams<br>• Dilute bases (0.1 – 0.5% NaOH) for weakly acidic compounds<br>• Strong bases (2 – 4% NaOH) for regenerating resins fouled with proteins, peptides<br>• Dilute acids (0.1 – 0.5% HCl) for weakly basic compounds<br>• Dilute oxidizing agents (< 0.5%) such as peroxide to enhance the removal of protein fouling<br>• Buffer elution for pH-sensitive compounds<br>• Water when adsorption is from an ionic solution<br>• Hot nitrogen or steam for volatile materials |

* 1 BV (Bed Volume) = 1 $m^3$ solution per $m^3$ resin or 7.5 gal per $ft^3$ resin

## Hydraulic Characteristics

Estimated bed expansion of AmberLite™ XAD™1600N Polymeric Adsorbent as a function of backwash flowrate and temperature is shown in Figure 4.

Estimated pressure drop for AmberLite™ XAD™1600N 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.

**Figure 4: Backwash Expansion**

Temperature = 10 – 60°C (50 – 140°F)

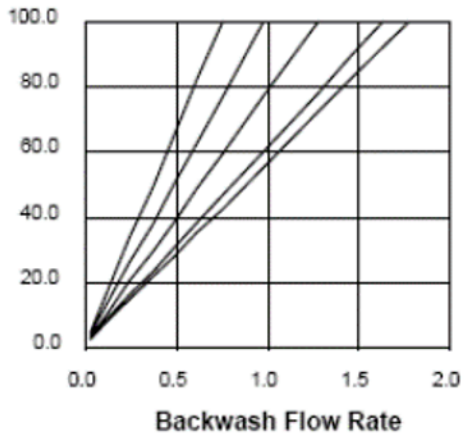
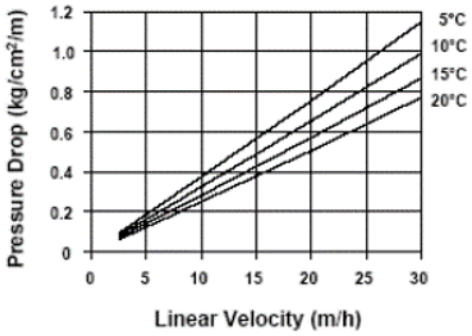



**Figure 5: Pressure Drop**

Temperature = 4.4 – 65.6°C (40 – 150°F)



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## Application Information

### Pretreatment

AmberLite™ XAD™1600N Polymeric Adsorbent is shipped as a water-wet product imbibed with sodium chloride (NaCl) and sodium carbonate ($Na_2CO_3$) 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, amino acids, and proteins

AmberLite™ XAD™1600N Polymeric Adsorbent can be considered as chromatographic media for these types of applications requiring the separation of similar solutes by combining narrow particle distribution, good mesoporosity, and 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 from polar solvents

These types of applications can be considered a simple capture step in which the adsorbent resin is used to remove solutes from an aqueous process stream. AmberLite™ XAD™1600N Polymeric Adsorbent will be useful in this type of application in which the narrow particle size distribution may give a higher operating capacity than AmberLite™ XAD™16N or AmberLite™ XAD™4 Polymeric Adsorbents.

## Product Stewardship

DuPont has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with DuPont products—from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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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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