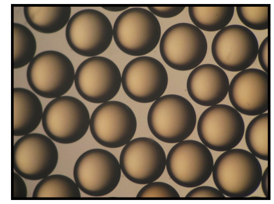
Product Data Sheet

AmberLite™ IRN78 OH Ion Exchange Resin

Nuclear-grade, Uniform Particle Size, Gel, Strong Base Anion Exchange Resin for Water Treatment Applications in the Nuclear Power Industry

Description



AmberLite™ IRN78 OH Ion Exchange Resin is designed specifically for use in nuclear loops where highest resin purity and stability are required, and where the "as supplied" resin must have a minimum of ionic and non-ionic contamination. These high standards of resin purity enable plants to achieve reliable and safe production whilst reducing the need for equipment maintenance and minimizing the impact of unscheduled outages.

AmberLite™ IRN78 OH is recognized as the premier anion resin in nuclear power applications due to its exceptional total exchange capacity and purity. It contains a minimum of 95% of the exchange sites in the hydroxide form and a maximum of 0.05% in the chloride form, and is further processed to minimize total chloride content to help prevent transient chloride levels when new resin is placed into service in both BWR and PWR systems.

The very high total anion exchange capacity can produce a 10 – 15% increase in operating throughput in the intended applications. Since the nuclear-grade resins from these applications are generally disposed of as rad waste, high capacity and long resin bed life are critical to minimizing rad waste disposal cost and volume. For most users, rad waste disposal cost will often exceed resin purchase cost, so high resin capacity directly translates into savings in these non-regenerable nuclear applications. Furthermore, longer bed life means fewer bed change-outs, less work, less resin handling, and less chance for radiation exposure.

The uniform particle size and the absence of fine resin beads result in a lower pressure drop compared to conventional resins. The particle size of AmberLite™ IRN78 OH is specifically designed to give an optimized balance of pressure drop, exchange kinetics, and resistance to separation from the cation exchange resins, AmberLite™ IRN99 H Ion Exchange Resin and AmberLite™ IRN97 H Ion Exchange Resin, when used in a mixed bed.

Applications

- Primary water treatment:
  - Primary coolant purification
  - Treatment of primary coolant blowdown
  - Control of reactor coolant chemistry by removing boron
- Fuel pool purification in single bed VVER systems
- Rad waste treatment and decontamination:
  - Removal of anionic radioactive material
- PWR steam generation blowdown (APG)
- BWR condensate polishing

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Purity

AmberLite™ IRN Ion Exchange Resins are manufactured as nuclear-grade using specific procedures throughout the manufacturing process to keep the inorganic impurities at the lowest possible level. Special treatment procedures are also utilized to remove traces of soluble organic compounds to meet the rigorous demands of the nuclear industry. These high standards of resin purity will help keep nuclear systems free of contaminants and deposits, and prevent increases in radioactivity levels due to activation of impurities in the reactor core. IRN resins are recommended in both non-regenerable and regenerable single bed or mixed bed applications where reliable production of the highest quality water is required and where the "as supplied" resin must have an absolute minimum of ionic and non-ionic contamination.

Historical Reference

AmberLite™ IRN78 OH Ion Exchange Resin has previously been sold as AmberLite™ IRN78 Ion Exchange Resin.

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Typical Properties

Physical Properties	
Copolymer	Styrene-divinylbenzene
Matrix	Gel
Type	Strong base anion
Functional Group	Trimethylammonium
Physical Form	Amber, translucent, spherical beads
Chemical Properties	
Ionic Form as Shipped	OH^-
Total Exchange Capacity	≥ 1.20 eq/L (OH^- form)
Water Retention Capacity	54.0 – 60.0% (OH^- form)
Ionic Conversion	
OH^-	≥ 95%
CO_3^{2-}	≤ 5%
Cl^-	≤ 0.05%
SO_4^{2-}	≤ 0.1%
Particle Size §	
Particle Diameter	630 ± 50 µm
Uniformity Coefficient	≤ 1.10
< 300 µm	≤ 0.2%
< 425 µm	≤ 0.5%
> 1180 µm	≤ 2.0%
Purity	
Metals, dry basis:	
Na	≤ 20 mg/kg
K	≤ 20 mg/kg
Fe	≤ 20 mg/kg
Cu	≤ 5 mg/kg
Co	≤ 5 mg/kg
Ca	≤ 10 mg/kg
Mg	≤ 10 mg/kg
Al	≤ 10 mg/kg
Hg	≤ 20 mg/kg
Heavy Metals (as Pb)	≤ 10 mg/kg
Other, dry basis:	
Cl	≤ 250 mg/kg
SiO_2	≤ 10 mg/kg
Stability	
Whole Uncracked Beads	≥ 95%
Friability:	
Average	≥ 600 g/bead
> 200 g/bead	≥ 95%
Solubility in Water	≤ 0.10%
Density	
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).

Suggested Operating Conditions

Temperature Range (OH^- form) ‡	5 – 100°C (41 – 212°F)
pH Range (Stable)	0 – 14

‡ Operating at elevated temperatures, for example above 60 – 70°C (140 – 158°F), may impact the purity of the loop and resin life. Contact our technical representative for details.

For additional information regarding recommended minimum bed depth, operating conditions, and regeneration conditions for mixed beds (Form No. 45-D01127-en) or separate beds (Form No. 45-D01131-en) in water treatment, please refer to our Tech Facts.

Hydraulic Characteristics

Estimated bed expansion of AmberLite™ IRN78 OH Ion Exchange Resin as a function of backwash flowrate and temperature is shown in Figure 1.

Estimated pressure drop for AmberLite™ IRN78 OH as a function of service flowrate and temperature is shown in Figure 2. These pressure drop expectations are valid at the start of the service run with clean water.

Figure 1: Backwash Expansion

Temperature = 10 – 60°C (50 – 140°F)

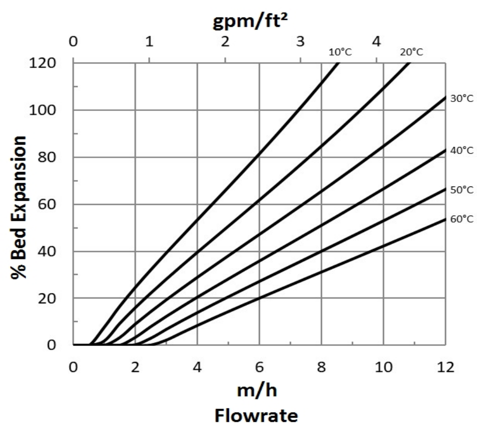
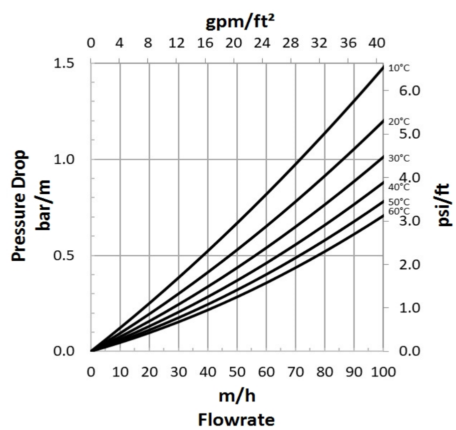


Figure 2: Pressure Drop

Temperature = 10 – 60°C (50 – 140°F)



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.

Customer Notice

DuPont strongly encourages its customers to review both their manufacturing processes and their applications of DuPont products from the standpoint of human health and environmental quality to ensure that DuPont products are not used in ways for which they are not intended or tested. DuPont personnel are available to answer your questions and to provide reasonable technical support. DuPont product literature, including safety data sheets, should be consulted prior to use of DuPont products. Current safety data sheets are available from DuPont.

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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