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AMBERLITE™ IRN317

Li^7 / OH form Nuclear Grade Mixed Bed

Introduction

AMBERLITE IRN317 resin is a stoichiometric equivalent mixed bed of gel strong acid cation resin in the Li^7 form and gel strong base anion resin in the OH form. Amberlite IRN317 resin is specifically designed for enhanced performance and long resin life in the Chemical and Volume Control System (CVCS) of Pressurized Water Reactors (PWR).

The cation resin used for this mixed bed is derived from Amberlite IRN99 resin, which is a uniform particle size, highly cross-linked gel cation exchanger. The anion exchange resin in this mixed bed is Amberlite IRN78 resin, which has a long established record of performance and reliability in nuclear applications.

The new highly crosslinked gel cation resin component of this mixed bed delivers the highest total capacity (typically 2.5 eq/L) and the best chemical and oxidative stability of any available nuclear grade resin. The enhanced oxidative stability significantly lowers the release of organic sulfonates thus reducing sulfate levels in the reactor coolant. The high level of crosslinking also provides substantially increased selectivity for removal of Cs^{137} and other radioactive species.

For additional information on the component resins used in Amberlite IRN317 resin, see the data sheets for Amberlite IRN78 and Amberlite IRN99 resins.

Properties

Physical Form	Mixture of dark and light amber translucent spherical beads	
Matrix	Polystyrene divinylbenzene copolymer	
Chemical Form	1 to 1 equivalent mixture of Li^+ and OH^- form resins	
Shipping Weight	45 lbs/ft^3 (720 g/L)	
	Cation resin	**Anion resin**
Functional Group	Sulfonic acid	Quaternary ammonium
Total Exchange Capacity	≥ 2.4 meq/ml (Li form)	≥ 1.2 meq/ml (OH form)
Moisture Content	33 - 40 % (Li form)	54 - 64 % (OH form)
% Regenerated Sites	99% Li^7, minimum	95% OH, minimum
% Cl form sites	---	0.1 % maximum
Particle size		
Retained on 20 mesh (0.850 mm)	5 % maximum	
Through 40 mesh (0.425 mm)	5 % maximum	
Through 50 mesh (0.300 mm)	0.1% maximum	
Na	50 mg/kg dry, maximum	
Fe	100 mg/kg dry, maximum	
Cu	50 mg/kg dry, maximum	
Al	50 mg/kg dry, maximum	
Pb	50 mg/kg dry, maximum	

Suggested Operating Conditions

Maximum Operating Temperature	140 °F (60 °C)
Minimum Bed Depth	36 inches
Service Flow Rate (Linear Velocity)	10 to 30 gpm/ft^2

Application

AMBERLITE IRN317 resin is specifically designed for the purification of primary reactor coolant in PWR plants. This application requires the removal of Cs137, Co58, I131, other radioisotopes, and chemical contaminants such as chloride and sulfate which may appear in the reactor coolant. Since the reactor coolant contains high background levels of boric acid buffered with Li7OH, the mixed bed resins will operate in the borate and Li7 form.

The cation resin component of Amberlite IRN317 resin is supplied in the Li^7 form in order to minimize fluctuations in the concentration of Li^7 in the reactor coolant when the mixed bed is first placed into service. Amberlite IRN317 resin is made using only certified isotopically pure Li^7OH in order to minimize the undesirable reaction:

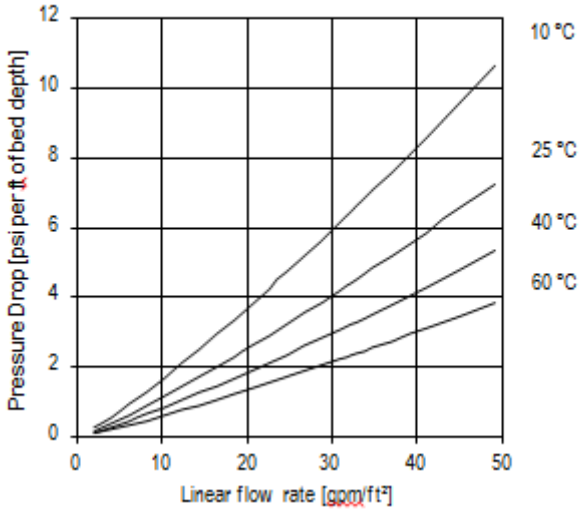
$$Li^6 + n \rightarrow H^3 + \alpha.$$

The anion resin component of Amberlite IRN317 resin is very highly regenerated to the OH form to insure that less than 0.1% of exchange sites are present in the chloride form or the sulfate form. Therefore Amberlite IRN317 resin can effectively control chloride and sulfate impurities even while operating at high background concentrations of lithium and borate.

Hydraulic Characteristics

The approximate pressure drop of Amberlite IRN317 resin in normal downflow operation is shown in the figure below as a function of service flow rate and water temperature. Pressure drop data are for clean beds which have not accumulated solids during the service run. If the bed accumulates solids, the pressure drop will increase.

Figure 1 Pressure Drop



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