PUROLITE

NRW-160

Macroporous Strong Acid Cation-Exchange Resin

(FOR THE TREATMENT OF RADIO-ACTIVE SOLUTIONS)

Technical Data

PRODUCT DESCRIPTION

Purolite NRW-160 is a macroporous polystyrene sulphonate cation exchanger designed to be mechanically strong and capable of withstanding conditions of considerable stress (thermal and oxidative) such as those found in the treatment of radio-active circuits and waste water. The high capacity and ion selectivity of **Purolite NRW-160** especially for Caesium 137 makes this the resin of choice where such radio-active isotopes need to be concentrated before disposal. This resin also has extremely fast kinetics when compared with other macroporous strong acid cation resins. **Purolite NRW-160-Li7,** the Lithium (isotope) form of this resin, is also useful for the decontamination of primary cooling circuits conditioned with Lithium-7 hydroxide. As the Lithium-6 isotope can produce tritium by neutron capture, Lithium-7 is often preferred.

Purolite NRW-160 may be used on its own for removal of traces of heavy metals or in a mixed bed system such as **Purolite NRW-354** which offers complete demineralisation for the radio-active solution. Alternatively **Purolite NRW-160** may be combined in a mixed bed unit with **Purolite NRW-500** and in this case offers the possibility of separation and regeneration. Special grades of the Purolite **NRW-160** and **Purolite NRW-500** can be supplied to improve resin separation prior to regeneration.

Typical Chemical and Physical Characteristics

Polymer Structure	**Macroporous polystyrene crosslinked with divinylbenzene**
Appearance	**Spherical beads**
Functional Groups	**Polystyrene Sulphonate**
Ionic Form - as shipped	**Hydrogen - H^+ [99.9%]**
Total Capacity (H^+ Form)	**2.1 eq/l min**
Moisture Retention (H^+ Form)	**43-48%**
Bead Size Range (microns)	**+1200 <2%, -420 <2%**
Screen Size Range (U.S. Standard Screen)	**16-40 mesh, wet**
Reversible Swelling (Na^+ ® H^+)	**4%**
Specific Gravity (H^+ Form)	**1.21**
Shipping Weight	**760-800 kg/m^3 (47.5-50 lb/ft^3)**
Temperature Limit (Na^+ Form)	**140°C (285°F)**
(H^+ Form)	**120°C (250°F)**
pH Limits	**None**
Impurities: Na + K ppm	**40 max**
Fe ppm	**50 max**
Heavy Metals ppm	**40 max**

RADIOACTIVE DECONTAMINATION

The capacity for decontamination is evaluated by the decontamination factor (FD), defined as the ratio of radioactivity of the influent over the radioactivity of the effluent.
This capacity depends on the nature of the radioactive isotope being removed and, the cross-linking of the strong acid cation resin in use. The table below shows that the coefficient of selectivity varies with the level of cross linking of the resin matrix.

%DVB	4	8	12	16
Li	0.9	0.85	0.81	0.74
H	1.0	1.0	1.0	1.0
Co	2.65	2.8	2.9	3.05
Cs	2.0	2.7	3.2	3.45

Clearly the affinity for these metals increases with cross-linking. It follows therefore that an ion exchanger containing 16% DVB will have a higher useful capacity, and hence a longer cycle than a conventional gel or macroporous resin, particularly when it is necessary to load cesium. It follows also that the mixed bed resin **Purolite NRW-354** which contains **Purolite NRW-160** as the cation component will have similar properties.

Comparative tests have been made in primary circuits containing lithium and boric acid to evaluate the performance of mixed beds containing strong acid cation resins of conventional gel type, and the highly crosslinked macroporous type. Decontamination factors are given below.

	gel-type mixed bed		macroporous mixed bed	
Volume Treated v/v	FD Cs 137	FD Co 58	FD Cs 137	FD Co 58
11,000	3			
33,000	1	61	32	127

Influent mean Co 58 1 10^{-3} Curie/m^3
Cs 137 1.3 10^{-1} Curie/m^3