GRAVEX®

Gravex® Macroporous Nuclear Grade Resins
GR-1-5 NG, GR-2-17 NG, GR-3-17 NG, GR-7-17 NG, GR-4-17 NG

These Gravex Nuclear Grade Ion exchange resins are polystyrene, macroporous type resins. They have been regenerated and processed to provide the highest possible performance in nuclear applications. GR-1-5 NG and GR-2-17 NG are fully tested and certified. Our unique blending process creates the less separable GR-3-17 NG mixed bed in a 2 cation:1 anion volume ratio. Gravex mixed beds are the most uniformly blended products available and have the same consistent cation to anion ratio in every package. A stoichiometric mixed bed version with $^7Li+$ form cation is GR-4-17 NG.

Applications — Reactor Coolant Treatment (CVCS, chemical and volume control system)

This series of macroporous Gravex resins is designed to remove fine particulate radionuclides including isotopes of Co, Ni, Fe, and Ag. The cation GR-2-17 NG by itself and as a component of the mixed beds, is also selective for the soluble species of the radionuclide metals. These Gravex products are used for cleanup after outages to help maintain plant restart schedules. The anion and cation products may be layered over either of the mixed beds. The GR-3-17 NG may be used in place of the GR-3-9 NG during full power operation to provide ongoing removal of fine particulates. Similarly the GR-4-17 NG replaces the GR-4-9 NG during full power operation. Each product continues to perform the normal functions of reactor water treatment and pH control. The GR-7-17 NG, ^7Li form cation component may be used to extend the bed life.

Radwaste Treatment — The GR-1-5 NG, GR-2-17 NG, and GR-3-17 NG products are also useful for removing soluble and fine particulate radionulides from liquid radwaste.
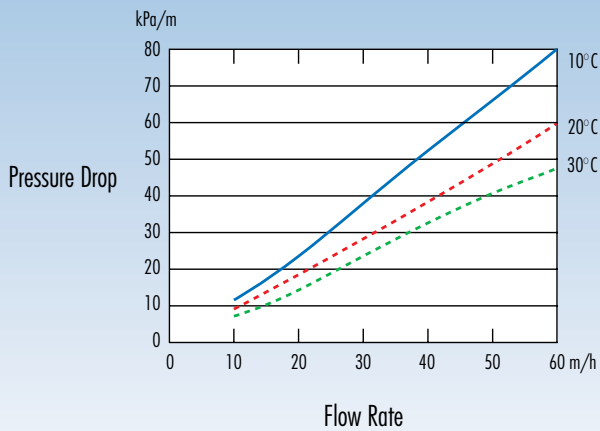
Spent Fuel Pools — GR-3-17 NG is chemically and physically resistant to the aggressive environment in spent fuel pools.

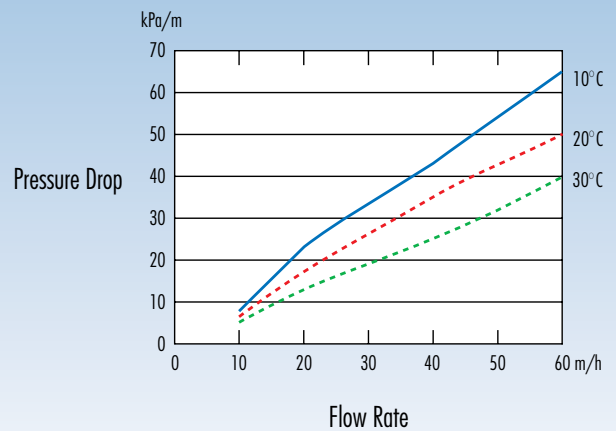| Typical Properties				
PRODUCTS	**GR-1-5 NG**	**GR-2-17 NG, GR-7-17 NG (^7Li form)**	**GR-3-17 NG**	**GR-4-17 NG**
Type	SBA Type 1	SAC	SAC/SBA	SAC/SBA
Matrix	Styrene DVB Macro	Styrene DVB Macro	Styrene DVB Macro	Styrene DVB Macro
Functional Group	Quaternary Ammonium	Sulfonic Acid	Sulfonic Acid, Quaternary Ammonium	Sulfonic Acid, Quaternary Ammonium
Ionic Form	OH^-	H^+	H^+/OH^-	$^7Li^+/OH^-$
Total Exchange Capacity (meq/mL)	0.9 (min)	2.1 (min)	2.1 / 0.9	2.1 /0.9
Ionic Conversion	97% OH (min) 3% CO_3 (max) 0.1% Cl (max) 0.1% SO_4 (max)	99% H / $^7Li^+$	99% / 97% (min) 3% CO_3 (max) 0.1% Cl (max) 0.1% SO_4 (max)	99% / 97% (min) 3% CO_3 (max) 0.1% Cl (max) 0.1% SO_4 (max)
Water Retention Capacity	55 – 68%	43 – 49%	43 – 49% / 58 – 68%	43 – 49% / 58 – 68%
Particle Size >1,190 µm / <300 µm	2% (max) 0.2% (max)	2% (max) 0.2% (max)	2% (max) 0.2% (max)	2% (max) 0.2% (max)
Friability Average g/bead / >200 g/bead	350 (min) 95% (min)	350 (min) 95% (min)	350 (min) 95% (min)	350 (min) 95% (min)
Whole Bead	95% (min)	95% (min)	95% (min)	95% (min)
Harmonic Mean Size	670 ± 120 µm	600 ± 75 µm	600 / 670 ± 75 /120 µm	600 / 670 ± 75 /120 µm

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GR-1-5 NG – Pressure Drop
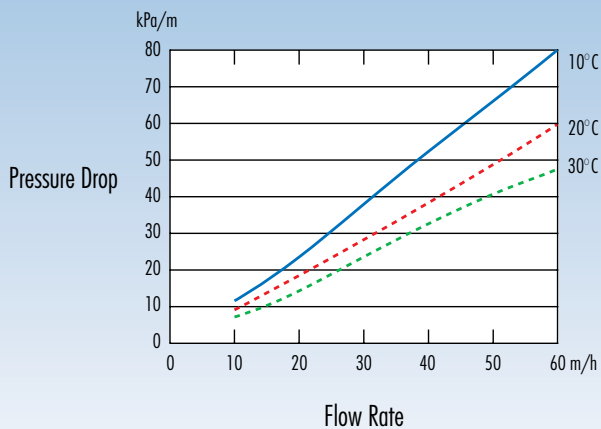

kPa/m — Pressure Drop vs Flow Rate (m/h), curves for 10°C, 20°C, 30°C

GR-3-17 NG, GR-4-17 NG – Pressure Drop

kPa/m — Pressure Drop vs Flow Rate (m/h), curves for 10°C, 20°C, 30°C

GR-2-17 NG, GR-7-17 NG – Pressure Drop

kPa/m — Pressure Drop vs Flow Rate (m/h), curves for 10°C, 20°C, 30°C

Recommended Operating Conditions

Maximum Operating Temperature	120°C (250°F) Cation 60°C (140°F) Anion
Minimum Bed Depth	800 mm (2.6 ft)
Linear Flow Rate	5 – 125 m / hr (2 – 50 gpm/ft^2)
Volume Flow Rate	8 – 50 BV / hr (1 – 6 gpm/ft^2)

Impurity - Mg/Dry Kg (max)

Impurity mg/dry kg (max)	GR-1-5 NG	GR-2-17 NG GR-7-17 NG
Na	20	50
Fe	50	50
Cu	10	10
Pb	10	10
Al	50	50
Ca	50	50
Mg	50	50
K	50	50
Zn	50	50
Co	30	30
Hg	20	20
SiO$_2$	100	
Total Cl	500	
Total SO	600	

GR-3-17 NG and GR-4-17 NG same as components for each impurity.

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