

GRAVEX® High Capacity Nuclear Grade Resins

GR-1-9 NG, GR-2-16 NG, GR-3-16 NG, GR-7-16 NG, GR-4-7 NG

These Gravex Nuclear Grade Ion exchange resins are very high capacity polystyrene, gel type resins. They have been regenerated and processed to provide the highest possible performance in nuclear applications. The Gravex cation is specially processed to minimize leachable sulfonic acids. Its high capacity and oxidative stability help

achieve optimal performance. Gravex mixed beds are the most uniformly blended products available and have the same consistent cation to anion ratio in every package. Our unique blending process creates the less separable GR-3-16 NG stoichiometric mixed bed. A ⁷Li⁺ form cation is available as GR-7-16 NG and in the GR-4-7 NG mixed bed.

TYPICAL PROPERTIES

Product	GR-1-9 NG	GR-2-16 NG; GR-7-16 NG (⁷ Li form)	GR-3-16 NG	GR-4-7 NG
Type	SBA Type 1	SAC	SAC/SBA	SAC/SBA
Matrix	Styrene-DVB Gel	Styrene-DVB Gel	Styrene-DVB Gel	Styrene-DVB Gel
Functional Group	Quaternary Ammonium	Sulfonic Acid	Sulfonic Acid / Quaternary Ammonium	Sulfonic Acid / Quaternary Ammonium
Ionic Form	OH ⁻	H ⁺ / ⁷ Li ⁺	H ⁺ / OH ⁻	⁷ Li ⁺ / OH ⁻
Total Exchange Capacity (meq/mL)	1.2 (min)	2.4 (min)	2.4 / 1.2	2.4 / 1.2
Ionic Conversion	97% OH (min)	99% H / ⁷ Li ⁺ (min)	99% / 97% (min)	99% / 97% (min)
	3% CO ₃ (max)		3% CO ₃ (max)	3% CO ₃ (max)
	0.1% Cl (max)		0.1% Cl (max)	0.1% Cl (max)
	0.1% SO ₄ (max)		0.1% SO ₄ (max)	0.1% SO ₄ (max)
Water Retention	54–60%	37–43%	37–43% / 54–60%	37–43% / 54–60%
Whole Bead	95% (min)	95% (min)	95% (min)	95% (min)
Friability	average g/bead	350 (min)	500 (min)	500/350 (min)
	> 200 g/bead	95% (min)	95% (min)	95% (min)
Particle Size	> 1,190 μm	2% (max)	2% (max)	2% (max)
	< 300 μm	0.2% (max)	0.2% (max)	0.2% (max)
Harmonic Mean Size	670 ± 50 μm	525 ± 50 μm	525/670 ± 50/50 μm	525/670 ± 50/50 μm

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

The series of higher crosslinked Gravex cation exchange resins is designed to increase the run times of the cation and mixed beds because the cation capacity is up to 30% higher than standard cations. The longer bed life helps to reduce radwaste disposal volumes. The cation GR-2-16 NG by itself and as a component of the mixed beds, is also selective for the soluble species of radionuclide metals. Each product continues to perform the normal functions of reactor water treatment and pH control. The GR-7-16 NG,

⁷Li⁺ form cation may be used in place of the GR-4-7 NG or the standard GR-4-9 NG to extend the bed life.

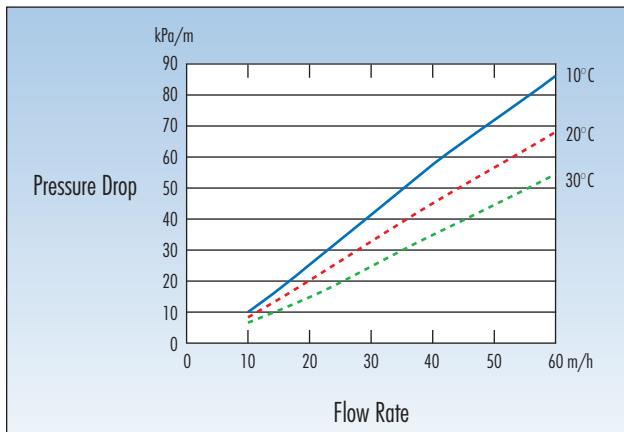
Other — The very high capacities of GR-2-16 NG and GR-3-16 NG make these Gravex products highly suitable for steam generator blowdown demineralizer systems and very useful for selective radionuclide removal from liquid radwaste.

Spent Fuel Pools — GR-3-16 NG is chemically and physically resistant to the aggressive environment in spent fuel pools. The particle size of the GR-2-16 NG cation component further enhances resistance to separation, limiting the potential for a bottom layer of cation exchange resin in the vessel.

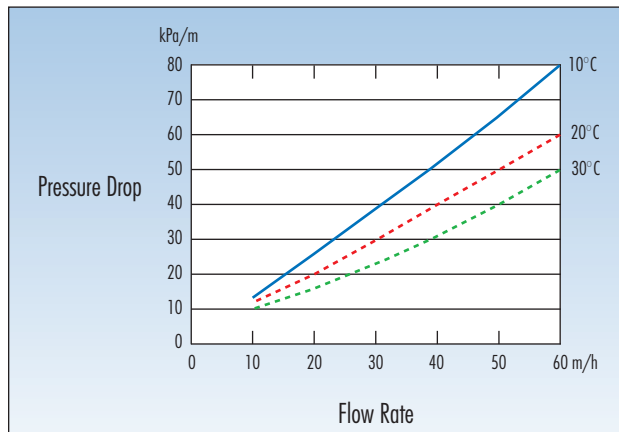
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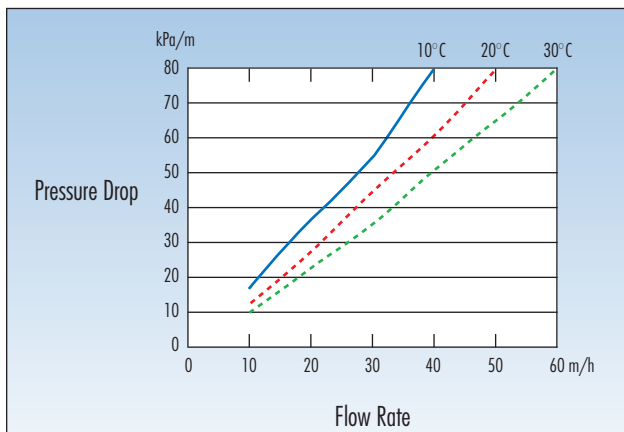
GR-1-9 NG – PRESSURE DROP



GR-3-16 NG, GR-4-7 NG – PRESSURE DROP



GR-2-16 NG, GR-7-16 NG – PRESSURE DROP



IMPURITY – MG/DRY KG (MAX)

Impurity – mg/dry kg (max)	GR-1-9 NG	GR-2-16 NG GR-7-16 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 ₄	600	

RECOMMENDED OPERATING CONDITIONS

Max. Operating Temperature	120°C (250°F) Cation 60°C (140°F) Anion
Min. 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 ³)

GR-3-16 NG and GR-4-7 NG same as components for each impurity.

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**Nuclear
Quality
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Program**

10CFR50
Appendix B

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