

Compliance: AIGA 106/19 · LOX Compatible

PRODUCT DESCRIPTION

Type: Silver-exchanged zeolite (Ag-X / Ag-A type)

Operating Temperature: 4K (–269°C) to 623K (350°C)

KEY PROPERTIES

- ✓ High silver content (≥40 wt%)
- ✓ Irreversible hydrogen capture
- ✓ High bulk density (≥0.75 g/cm³)
- ✓ Compatible with LOX service
- ✓ Chemisorption of H₂ via Ag₂O reaction
- ✓ Spherical bead form (1.0–1.5 mm)
- ✓ 10+ year service life (design)
- ✓ Non-regenerable in field

TECHNICAL DATA

Parameter	Unit	Specification
Product Designation	—	CryoGetter AG450
Zeolite Type	—	Ag-X / Ag-A
Silver Content	wt%	≥40
Particle Form	—	Spherical beads
Particle Size	mm	1.0–1.5
Bulk Density	g/cm ³	≥0.75
H ₂ Chemisorption Capacity	Pa·L/g	2.07×10 ³
Target Gas	—	H ₂ (hydrogen)
Reaction Mechanism	—	Ag ₂ O + H ₂ → 2Ag + H ₂ O
Reaction Type	—	Irreversible chemisorption

CRYOGENIC TANK PERFORMANCE DATA

Data for silver-exchanged zeolite hydrogen getter in the vacuum interlayer of cryogenic storage tanks.

Sources: FZ New Materials Ag400 specifications; Jalon Zeolite JLHA-100 datasheet; Chen et al., *Chinese Journal of Vacuum Science and Technology* 37(5):443–448, 2017; Bai et al., *VACUUM* 58(1):45–50, 2021; NASA KSC LC-39 Cryogenic Systems Study, 1970.

Parameter	Unit	Value
H ₂ outgassing proportion in cryogenic vessels (steel + insulation)	%	70–80% of total outgassing
H ₂ adsorption capacity (Ag ₄₅₀ , 77K, vacuum)	Pa·L/g	2.07 × 10 ³
Ag ₄₅₀ capacity vs PdO (reference getter, 197.2 mL(STP)/g)	ratio	~1/8; recommended dosage 10–15× PdO
Optimal vacuum maintenance level	Pa	< 10 ^{–2}
Service life in cryogenic tank vacuum interlayer	years	>10 (irreversible chemisorption)

Application rationale: In cryogenic tank vacuum interlayers, H₂ accounts for 70–80% of total outgassing from carbon steel, stainless steel, aluminum foil, and insulation materials. While molecular sieves (5A/13X) capture N₂, O₂, CO₂ and H₂O, they cannot retain H₂ at cryogenic temperatures. Silver-exchanged zeolites like CryoGetter AG450 chemisorb H₂ irreversibly, maintaining vacuum integrity for >10 years without regeneration.

***Dosage note:** Tank dosage cannot follow a fixed per-meter rule — it depends on vacuum interlayer volume, insulation type (perlite/MLI), service temperature, and vessel geometry. **Please contact East Far Materials engineering for tank-specific dosage recommendations.**

Ref: FZ New Materials Ag400 datasheet; Jalon JLHA-100 spec sheet; Chen et al. (2017) PdO/Ag₂O study; NASA KSC (1970).

ACTIVATION & SERVICE LIFE

Parameter	Specification
Activation Temperature	350°C
Activation Duration	6 hours
Activation Condition	Vacuum <10 Pa or dry N ₂ purge
Field Regeneration	Not possible (irreversible)
Factory Re-oxidation	400–500°C in O ₂ (theoretical only)
Service Life	10+ years (at designed dosage)
Replacement Criterion	When silver sites are saturated

DOSAGE FOR DN50 VJ PIPE

Parameter	Unit	Value
Dosage per Meter	g/m	2
3 m Spool (10 ft)	g	6
6 m Spool (20 ft)	g	12
9 m Spool (30 ft)	g	18
12 m Spool (40 ft)	g	24

WEIGHT RATIO WITH CRYOGETTER 5A13X

Configuration	5A13X : AG450 Ratio
Conservative (longer life, lower cost)	80 : 1.5
Enhanced H ₂ protection (recommended)	60 : 2

Application: Long runs or high-H₂-risk applications

INSTALLATION METHOD

Dispersed Capsule Placement	Small Perforated SS Capsules	15mm × 10mm Diameter	200µm Mesh	Both Ends of Each Spool	Midpoint for >6m Spools
Install within 2h of Activation					

Capsule Dosage: 2-4g per capsulePlacement: Near bayonet joints

TARGET APPLICATIONS & MARKETS

Vacuum Jacketed Pipe	Cryogenic Transfer Line	Superconducting Cable	LNG Pipeline	LOX Service	ISO Container	Dewar
Cryogenic Storage Tank (LN ₂ /LOX/LAr/LH ₂)						
Semitrailer / Rail Tank						
Nuclear Fusion Cryogenic Module						

- ⚠ **Critical Warning:** CryoGetter AG450 operates via irreversible chemisorption — H₂ is consumed through a chemical reaction, not physically trapped. Field regeneration is NOT possible. Once silver sites are saturated, the material must be replaced. Spent AG450 contains metallic silver — follow local regulations for heavy metal waste disposal.

Technical Note: H₂ migrates freely in vacuum and distributes uniformly — CryoGetter AG450 placement at ends provides sufficient coverage. Central placement is supplementary for long runs. Without AG450, hydrogen accumulates from stainless steel outgassing, increasing gas conductivity and degrading thermal insulation performance by 30-50% within 5 years. (Ref:)