Metal-X™ Purification Medium
NANOCHEM® Corrosive Gas Purifiers

Next Generation of Corrosive Gas Purification

NANOCHEM® Metal-X™ (a.k.a. MTX™) purification medium is a super-activated *inorganic* compound, which removes moisture (H_2O) from corrosive gases, reducing or preventing the corrosion of components of the gas delivery system. Such corrosion products can generate killer volatile and non-volatile metal impurities that can significantly affect process yields and device yields as well as shorten the useful life of the gas delivery system. NANOCHEM® Metal-X™ also removes *volatile* metal impurities, often present as volatile metal halides and metal oxy-halides in the feedstock (corrosive gas, as supplied by the manufacturer) and from reaction of the corrosive gas with the piping components. Such volatile impurities cannot be removed by particle filters. NANOCHEM® Metal-X™ is the only corrosive gas purification media that has been proven to remove both moisture and metals (volatile and non-volatile) from corrosive gases.

Gases Purified by Metal-X™

HCl – Hydrogen Chloride
HBr – Hydrogen Bromide
SiH_2Cl_2 – Dichlorosilane or DCS*
$SiHCl_3$ – Trichlorosilane or TCS*
BCl_3 – Boron Trichloride*
Cl_2 – Chlorine*
$SiCl_4$ – Silicon Tetrachloride*
CO – Carbon Monoxide
NO – Nitric Oxide*
CCl_4 – Carbon Tetrachloride

*Consult your Sales Representative for further information

Features and Benefits

NANOCHEM® Metal-X™ removes:

- **Moisture** (H_2O)
- **Particulates** (non-volatiles)
- **Volatile Transition Metal** compounds of Fe, Mo, Cr, Ti, Ni, Mn

- Improves & ensures gas purity for process consistency
- Improves process performance & yields
- Protects equipment from corrosion
- Applicable for purification at the
  - **Source** (at full cylinder pressure), and
  - **Point-of-use** (< 100 psig) at the process tool
- **MTX™ offers Highest Lifetimes**
  ~ 30% higher capacity than previous generation of NANOCHEM® corrosive gas media
- **MTX™ offers Improved Efficiency**
  < 1 ppb H_2O (in N_2 matrix by APIMS)
  < 100 ppb H_2O (LDL in HBr by FTIR & Laser IR / Lamda Scan)
- No external power source required
- Does not require heating or cooling

LDL Lower Detection Limit of Analytical Test Method
APIMS Atmospheric Pressure Ionization Mass Spectrometry
FTIR Fourier Transform Infrared Spectrometry
ICP-MS Inductively Coupled Plasma with Mass Spectrometry

Critical Applications

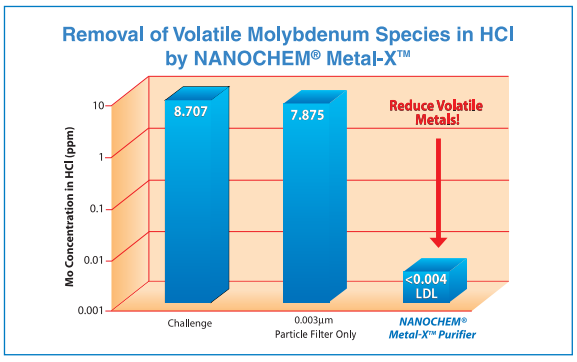
- Reduce metals in etching and chamber cleaning
- Reduce metals in Epi Si CVD source gas
- Fiber optics & other ultra-high purity applications

Specifications

Moisture < 100 ppb in HBr (by FTIR, Laser IR / Lamda Scan)
< 150 ppb in HCl
Volatile Metal Compounds of Fe, Mo, Cr, Ti, Ni & Mn
– Typical reduction of 2-5 orders of magnitude and to limit of detection of analysis by ICP-MS

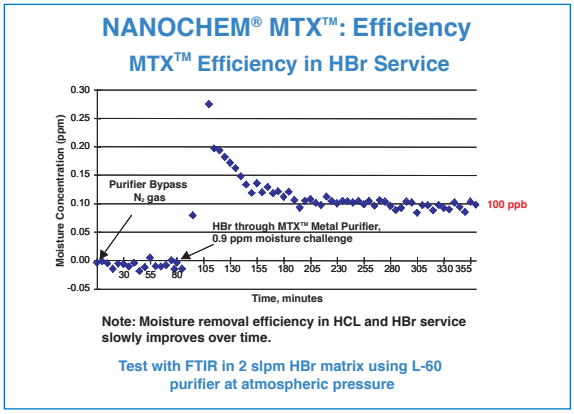
Removes *Killer* Volatile Metals

The performance of NANOCHEM® Metal-X™ for the removal of volatile molybdenum chlorides in HCl is illustrated below. Similar performance is obtained with volatile titanium chlorides. Removal of volatile iron chlorides has also been confirmed.



Remove H_2O & Increase Yields

The superior performance of NANOCHEM® Metal-X™ is noted in the Efficiency for the Removal of H_2O in HBr:



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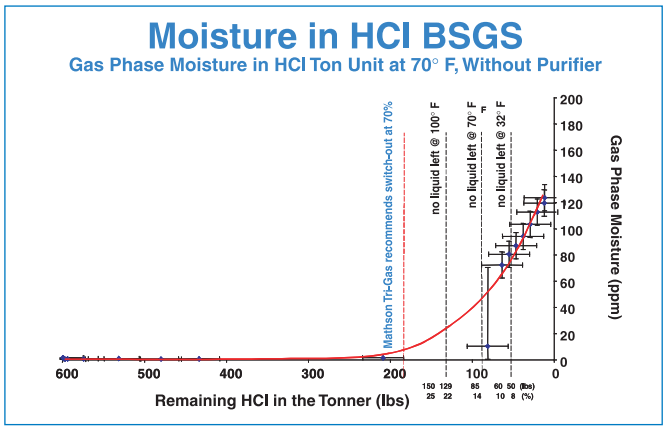
ask. . .The Gas Professionals™

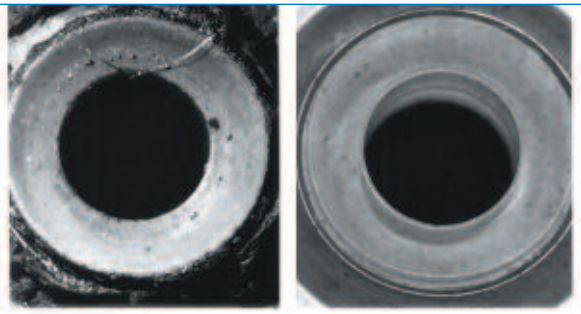
Proven for High Flow Applications

Moisture removal by NANOCHEM® Metal-X™ medium down to ultra low levels has been proven for flow rates up to 900 slpm (54 NM³/hr). You now have the option to use stainless steel piping instead of expensive alloys.



Prevent Component Corrosion

Photographs of Kel-F valve seats of valves in HBr service for **3 years** are shown below. Deposits of corrosion products are clearly visible on the valve seats without HBr purification (below left) causing particle and volatile metal emissions and leakage across the seat. Valve seats are free of corrosion products even after 1000 open/close cycles in HBr service, with HBr purified with NANOCHEM® Metal-X™ (below right).



Kel-F valve seats of line valves in HBr Service, ***without*** NANOCHEM® purifier, 1000 cycles.

Kel-F valve seats of line valves in HBr Service, ***with*** NANOCHEM® purifier, 1000 cycles.

Torres R., et al, Fabtech, 12th edition, pg 139-146, 2000

Purifier Models / Sizes

NANOCHEM® Metal-X™ (a.k.a. MTX™) purification medium is available in a variety of hardware configurations – < 1 slpm to 750 slpm (< 0.1 NM³/hr to 45 NM³/hr) for point-of-use, distribution, source, & bulk purification applications:

Model	Maximum Recommended Flow Rate** slpm	(NM³/hr)	Media Volume ml or liters	Maximum Allowable Operating Pressure Without End-Point psig (MPa)
MiniSentry™	1	(0.06)	12 ml	3,000 (21)
Purifilter®	3	(0.2)	25 ml	1,000 (7)
A-Series*	50	(3)	300, 500, 2000 ml	500 (3.55)
L-Series	50-150	(3-9)	60, 300, 500, 2000 ml	500 (3.55)
H-Series	50	(3)	300, 500 ml	500 (3.55)
HP-Series	50	(3)	500 ml	2,850 (19.8)
MS-Series	1000	(60)	8, 16, 32 liters	300 (2.17)
WK-Series*	3-300	(0.2-18)	55, 500, 2500 ml	500 (3.55)
	1000	(60)	9 liters	350 (2.51)

*Drop-in replacements available for competing hardware designs.
**For higher flow rates, contact Matheson Tri-Gas, Inc.
NOTE: 0.003 µm particle filter with 99.9999999% retention standard on all models.

Please contact your local MATHESON Sales Engineer or call (215) 648-4000 to obtain a purifier lifetime estimate for your specific operating conditions.

Options

Manual & Air-Operated Bypass Modules
0.003 µm particle filter with 99.9999999% retention (standard on models up to 4-lit media volume, optional for 8, 16, 32-lit models).*
End-Point Detection = NOT AVAILABLE

* NOTE: A particulate filter is required for the removal of particulates (and non-volatile metal compounds) in the gas.

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