

NANO CHEM[®]

PURELITE™ Purification Medium-Non DG NANO CHEM[®] Inert and Hydrogen Gas Purifiers Removal of Hydrocarbons, CO₂ and H₂O

Overview

NANO CHEM[®] PURELITE™ Purifiers are designed to remove trace hydrocarbons, CO₂ and H₂O from inert gases and hydrogen. An example of a process sensitive to hydrocarbon contamination is DUV lithography. Deposition of carbon-based films from purge gas contaminants on the optical components decreases light throughput and negatively affects the patterning process.

NANO CHEM[®] PURELITE™ purification medium, the active component in White Knight™ (WK-Series) Purifiers, removes non-methane hydrocarbons and H₂O with sub-ppb efficiency and high capacity for extended purifier lifetime. CO₂ is removed to LDL limits of instrumentation.

Applications

- Purge gas purification for photolithography where trace hydrocarbons are detrimental to transmission of optical components (carbon deposits)
- Compatible gases include Nitrogen (N₂), Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), Xenon (Xe), Hydrogen (H₂), Deuterium (D₂), and Sulfur Hexafluoride (SF₆)

Features and Benefits

- Custom-designed adsorbent material for point-of-use removal offering:
 - High Capacity
 - Long Lifetimes
 - Sub-ppb Efficiency
 - Low Overall Cost of Ownership
- Room temperature operation - no power required
- No conditioning required
- Easy to install and operate
- Media refills available for WK-500F and WK-2500F purifier models
- Patented technology
- Non dangerous good

Specifications

- 0.003 µm particle filter with 9-log retention (99.9999999%)
- Internal surface finish < 10 µin R_a
- Metal parts of Stainless Steel, Type 316L
- Maximum operating temperature of 40°C (104°F)

n-Butane Removal by NANO CHEM[®] PURELITE™ Purifier Capacity

Large capacity of PURELITE™ Purifier for n-butane removal was experimentally verified by FTIR (Figure 1). Heating to 100°C and extended purging with inert gas did not release adsorbed n-butane, indicating strong affinity for hydrocarbons.

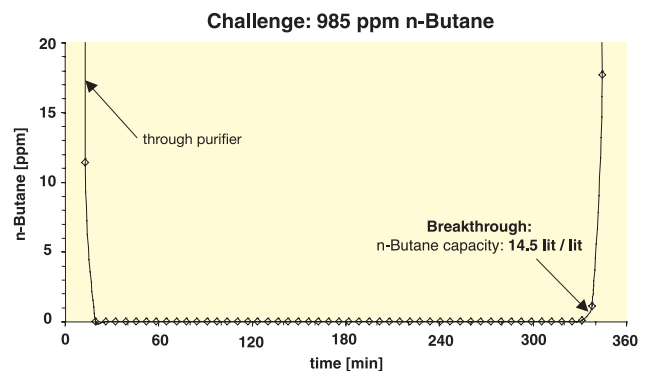


Figure 1: n-Butane Capacity of PURELITE™ Purifier
30 ml bed volume, 958 ppm challenge at 1.4 slpm (0.8 NM³/hr)

FTIR (Fourier Transform Infrared Spectroscopy)

Efficiency

APIMS measurements indicate removal of n-butane in argon to < 100 ppt (Detection Limit of APIMS) at challenges as high as 50 ppm (Figure 2). Purifier was initially bypassed for < 25 minutes to verify instrument response.

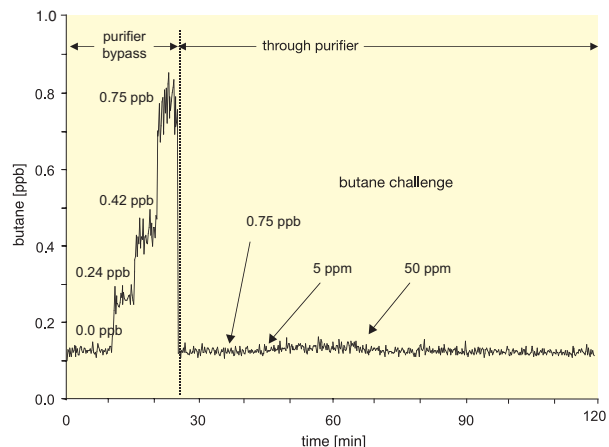


Figure 2: Efficiency of PURELITE™ Purifier for n-butane in argon removal at challenges from 0.75 ppb to 50 ppm. (200 ml bed volume)

ppt - parts per trillion

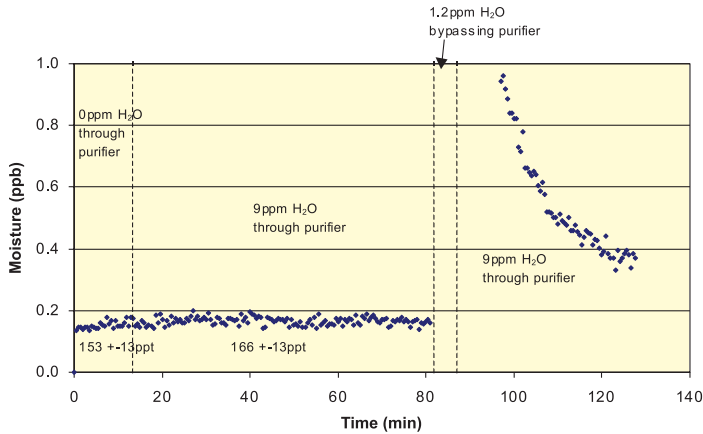
APIMS (Atmospheric Pressure Ionization Mass Spectrometry)



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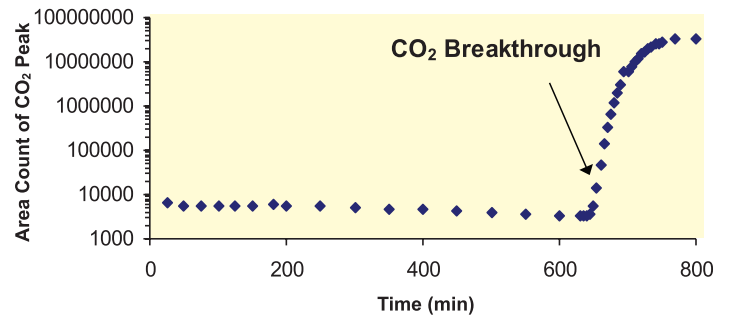
APIMS Efficiency Data

9 ppm H₂O Challenge in Argon demonstrated moisture efficiency of less than 300 ppt, (detection limit of the APIMS)



CO₂ Capacity in Helium

Capacity of 5.5 L/L based on a challenge of 500 ppm CO₂ in He at 1 slpm



Analytical Performance

Typical Performance

Impurities are typically removed to the detection limits of state-of-the-art analytical techniques

Impurity/ Matrix	Efficiency (ppb)	Challenge (ppm)	Analytical Method
H ₂ O in Ar	< 0.3 (LDL)	35	API-MS
CO ₂ in He	< 11 (LDL)	500	GC-DID
GeH ₄ in N ₂	< 0.1 (LDL)	2.5	API-MS
SiH ₄ in N ₂	< 0.1 (LDL)	2.5	API-MS
Siloxanes in N ₂	< 0.1 (LDL)	(trace)	API-MS
C ₄ H ₁₀ in Ar	< 0.2 (LDL)	50	API-MS

LDL Lower Detection Limit of Analytical Test Method
 APIMS Atmospheric Pressure Ionization Mass Spectrometry
 GC-DID Gas Chromatography with Discharge Ionization Detector

Purifier Models / Sizes

NANOCHEM® PURELITE™ purification medium is available in a wide variety of hardware configurations for point-of-use, distribution, source and bulk purification applications:

Model	Maximum Recommended Flow Rate**		Media Volume ml or liters	Maximum Allowable Operating Pressure	
	slpm	(NM ³ /hr)		psig	(MPa)
Purifilter®	3	(0.2)	25 ml	1,000	(7)
A-Series*	50	(3)	300, 500, 2000 ml	500	(3.55)
L-Series	8-150	(0.5-9)	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*	3-250	(0.2-15)	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

NOTE: 0.003 µm particle filter with 99.9999999% retention standard on all models.

Specifications are subject to change. Please check www.mathesongas.com for most current information.

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Printed in USA PB-51 02/2025



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