

HCX™ Purification Medium NANOCHEM® Inert Gas Purifiers

Removal of Hydrocarbons from Inert Gases & Hydrogen

Overview

NANOCHEM® HCX™ Purifiers are designed to remove trace hydrocarbons 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.

NANOCHEM® HCX™ purification medium, the active component in White Knight™ (WK-Series) Purifiers, removes non-methane hydrocarbons with sub-ppb efficiency and high capacity for extended purifier lifetime.

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), Carbon Dioxide (CO₂), Deuterium (D₂), CDA, and Sulfur Hexafluoride (SF₆)

Features and Benefits

- Custom-designed adsorbent material for point-of-use hydrocarbon removal offering:
 - **High Capacity**
 - **Long Lifetimes**
 - **Sub-ppb Efficiency** for non-methane hydrocarbon removal in inert gases (N₂, He, Ne, Ar, Kr, Xe), Hydrogen (H₂), and Carbon Dioxide (CO₂)
 - **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-HCX and WK-2500F-HCX purifier models
- Patented technology

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 NANOCHEM® HCX™ Purifier

Capacity

Large capacity of HCX™ 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.

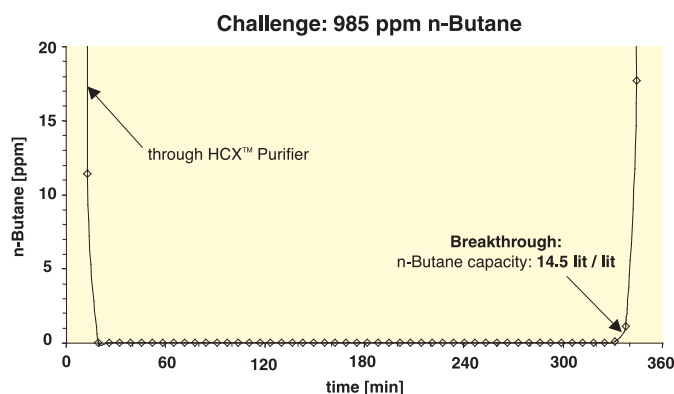


Figure 1: n-Butane Capacity of HCX™ Purifier
30 ml bed volume, 958 ppm challenge at 1.4 slpm (0.8 NM³/hr)

FTIR (Fourier Transform Infrared Spectroscopy)

Efficiency

APIMS measurements indicate removal of n-butane 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.

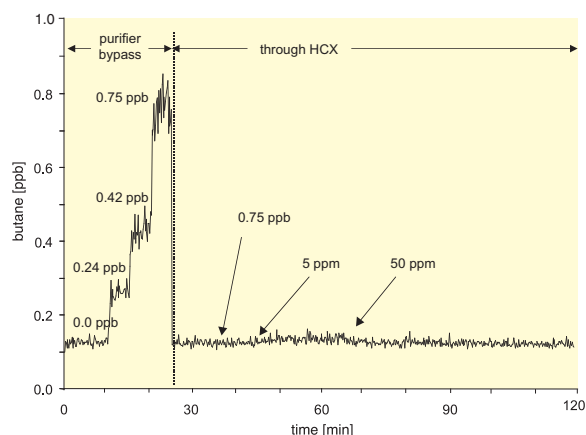


Figure 2: Efficiency of HCX™ Purifier for n-butane removal at challenges from 0.75 ppb to 50 ppm. (200 ml bed volume)

ppt – parts per trillion

APIMS (Atmospheric Pressure Ionization Mass Spectrometry)



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Purifier Models / Sizes

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

Model	Maximum Recommended		Media Volume ml or liters	Maximum Allowable Operating Pressure	
	Flow slpm	Rate** (NM ³ /hr)		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	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 99.999999% retention standard on all models.

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