

NANOCHEM[®]

INX-Plus™ Purification Medium

Removal of Oxygenated Impurities and Hydrocarbons

NANOCHEM[®] INX-Plus™ is an inorganic medium that provides high capacities and efficiencies and offers resistance to air intrusions. NANOCHEM[®] INX-Plus™ removes H₂O, O₂, CO₂, CO, SO_x, NO_x and trace hydrocarbons from inert gases, CH₄, CF₄, H₂, D₂. 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.

Byproducts upon accidental exposure of air to the purifier are limited to easily removable compounds, such as carbon dioxide, moisture, and trace methane which do not condense in process lines and can be purged from the system.

NANOCHEM[®] INX-Plus™ is available in a wide range of purifier sizes from compact point-of-use to bulk purifiers capable of handling up to 5000 slpm and 3000 psi.

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), Tetrafluoromethane (CF₄) and Methane (CH₄)

Specifications

- < 0.1 ppb O₂, H₂O, CO₂, CO in inert gases and **down to ppq levels** for hydrocarbon and refractories measured by state-of-the-art methodologies
- Maximum operating temperature of 40°C (104°F)

Features and Benefits

- Purification of inert gases and methane used in ultra-high purity applications
- Ideal for SiGe Epi, GaN and SiN processes
- 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), H₂, D₂, CF₄, CH₄
- **Best Impurity Removal Efficiencies**
- **Fiber Optic Endpoint Detection available**
- Removes oxygenated species H₂O, O₂, CO₂, CO, SO_x, NO_x and trace hydrocarbons
- Improves and ensures gas purity for process consistency
- Demonstrated improvements in process yield and device quality
- No hydrocarbon breakdown with air intrusions
- Does not require heating and cooling
- No external power source required, except for fiber optic sensor
- 0.003µm particle filter with 99.9999999% retention
- Patented technology



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ANALYTICAL PERFORMANCE

Typical Analytical Performance

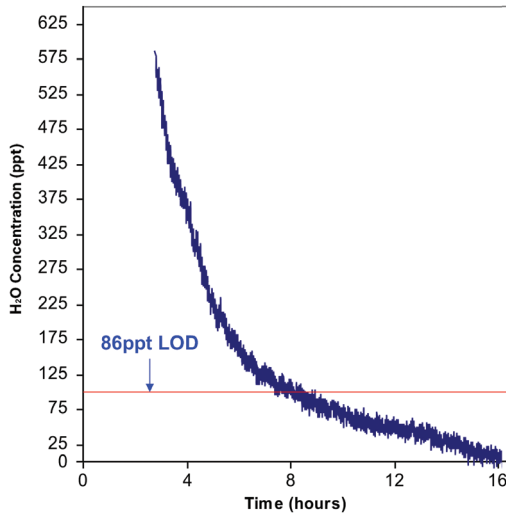
Impurities are typically removed to the detection limits of state-of-the-art analytical techniques.

Gas Type	Contaminants	Outlet Purity
Inerts - Nitrogen (N ₂), Argon (Ar), other inerts	H ₂ O	< 86 ppt
	O ₂	< 50 ppt
	CO	< 100 ppt
	CO ₂	< 24 ppt
	Benzene	< 156 ppq
	Toluene	< 93 ppq
	Ethylbenzene	< 96 ppq
	m,p-Xylene	< 79 ppq
	o-Xylene	< 112 ppq
	Refractories*	< 134 ppq
	H ₂	< 1 ppb

Impurity removal depends on purifier material and incoming gas specification
 *Refractories as TMDSO (Tetramethyldisiloxane)

H₂O Removal by NANOCH_{EM}® INX-Plus™ 360 mL Purifier

APIMS measurements indicated removal of H₂O to <86 ppt (Detection Limit of APIMS) at challenges as high as 1 ppm

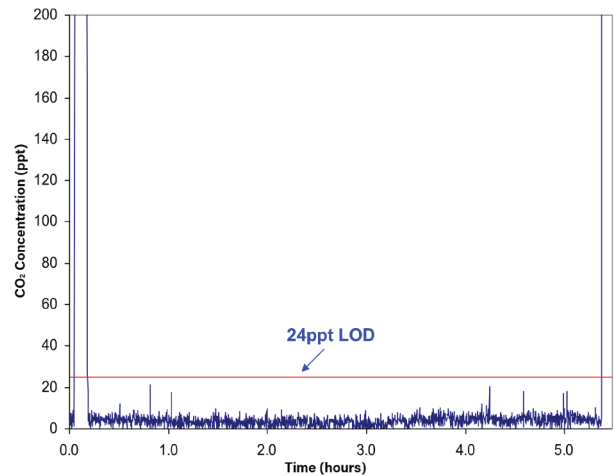


Efficiency of INX-Plus purifier for H₂O removal at challenge of 1ppm

APIMS (Atmospheric Pressure Ionization Mass Spectrometry)

CO₂ Removal by NANOCH_{EM}® INX-Plus™ 360 mL Purifier

APIMS measurements indicated removal of CO₂ to <24 ppt (Detection Limit of APIMS) at challenges as high as 1 ppm



Efficiency of INX-Plus purifier for CO₂ removal at challenge of 1ppm

APIMS (Atmospheric Pressure Ionization Mass Spectrometry)

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