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ELECTRONIC
FLUOROCARBONS, LLC

ETCH GASES FLUOROCARBONS

METHYL FLUORIDE

Advanced Dielectric Etching in Semiconductors

Fluorocarbons impact the environment by contributing to global warming. EFC continues to innovate lower GWP chemistries for semiconductor device manufacturing and to protect our environment.

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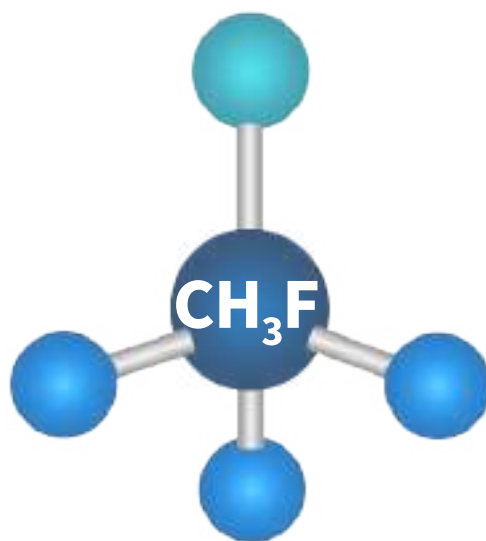
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METHYL FLUORIDE/HALOCARBON 41

CH₃F

Increasing importance for nanoscale device fabrication is the ability to control atomic scale etching with innovative and selectivity etch chemistries. Atomic Layer Etching (ALE) allows efficient and precise etching to meet critical dimensions with shrinking geometries below 10 nm. Multilayer films are formed by alternating silicon oxide and silicon nitride thin films. The multilayer film can be selectively etched by supplying a tailored fluorocarbon gas.

Efficient etching with precision is extremely important in the electronic industry. Innovative etch gases with extremely low global warming potential (GWP) that can help improve etch performance and protect environment when compared to conventional fluorocarbon gases are desired.



Ultra-Pure Electronic Grade
TOTAL PURITY >99.995%

EFC is a leader in innovative solutions for the electronic industry with synthesis, purification, and custom packaging of fluorocarbon gases and provides environmentally safer alternatives.

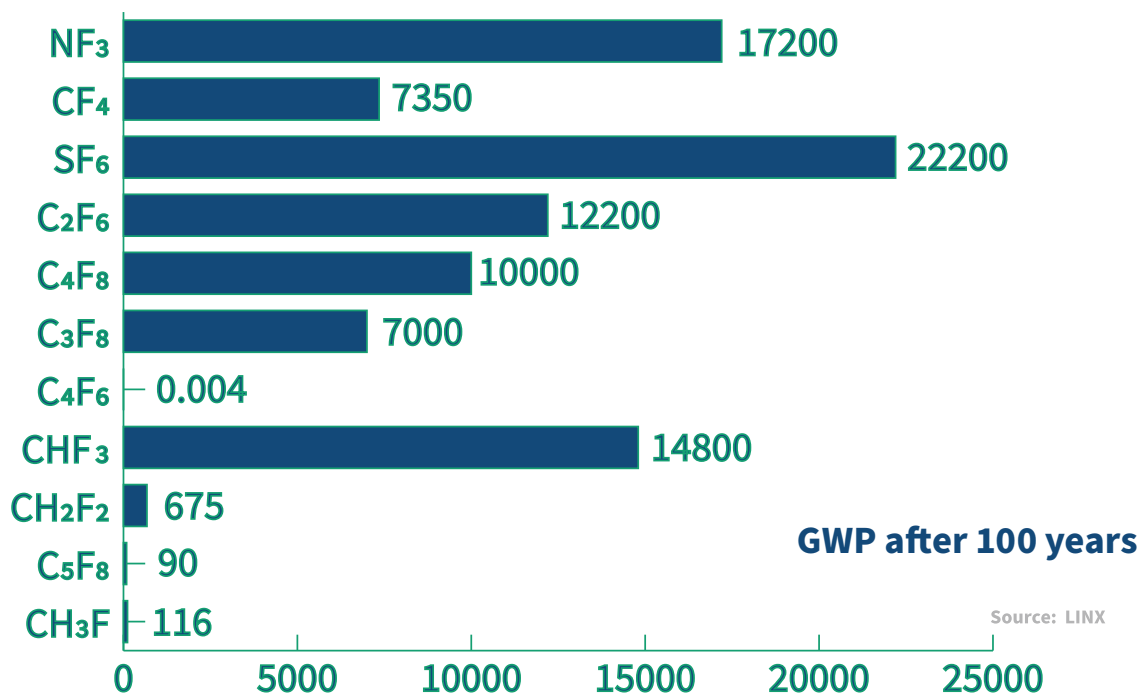
METHYL FLUORIDE, CH₃F

Methyl Fluoride (CH₃F), or fluoromethane, is a non-toxic common refrigerant also known as HFC-41. It is an environmentally friendly dry etching gas with low GWP. For electronics, high purity methyl fluoride is required and can be used in high performance inductively coupled plasma etching of Si, SiO₂ and Si₃N₄ layers efficiently. In ALE, enhanced control and low damage with minimal influence on sensitive areas and surfaces is required, especially at the gate. Methyl fluoride is an alternative dry etching gas

that can potentially be used in both RIE and ALE. It demonstrates a significantly reduced global warming effect as compared to C₄F₈ with high etch rates.

EFC provides a wide variety of fluorocarbon gases that can be tailored with varying fluorine content, C_xF_y (CF₄, CH₂F₂, CHF₃ and CH₃F). The fluorine content can be an effective way to control desired etch rates on select films.

GLOBAL WARMING POTENTIAL FOR VARIOUS ETCH GASES



PHYSICAL PROPERTIES

MOLECULAR WEIGHT	34.03 (gmol⁻¹)
BOILING POINT	-78.4 (°C)
VAPOR PRESSURE	19.65 (bar, @ 0°C)
CRITICAL TEMPERATURE	44.5 (°C)
RELATIVE GAS DENSITY	1.2
GAS DENSITY	2.18 (kgM⁻³ @ 15°C and 1 atm)
RELATIVE LIQUID DENSITY	0.61 (gcc⁻¹)
EXPLOSION LIMITS (VOL%)	2.6-21.7 (vol%)

Methyl fluoride is a colorless flammable gas with a vapor density > 1, it has an ether like odor and liberates hydrogen fluoride when it is burned.

EFC purifies methyl fluoride to electronic grade (>4N5) and provides tight quality controls. It is packaged in pre-cleaned and conditioned cylinders with either pneumatic or manual valves.



CH₃F Purity	>99.995%
Impurities	Specification, ppmv
N ₂	8
O ₂	1
CO ₂	5
CF ₄	10
THC (CH ₄)	2
H ₂ O	1
Other Halocarbons/Fluorocarbons	10
Acidity	0.1
Shelf Life (months)	36

ELECTRONIC FLUOROCARBONS

Etch Gases	Standard								
	Purity %	Size*	Contents		Pressure		Total Cylinder Weight		Standard Valve
			lbs.	kg.	psig	bar	lbs.	kg.	
Tetrafluoromethane, CF ₄	99.999	44	70	32	2000	138	205	93	320, 716
Sulfur hexafluoride, SF ₆	99.99	44	115	52	320	22	248	113	590, 716
Hexafluoroethane, C ₂ F ₆	99.995	44	95	43	430	30	230	104	680, 716
Octafluorocyclobutane, C ₄ F ₈	99.999	44	44	20	25	2	179	81	680, 716
Octafluoropropane, C ₃ F ₈	99.995	44	100	45	100	7	239	105	680, 716
Hexafluoro 1,3, butadiene, C ₄ F ₆	99.9	44	40	18	25	2	150	68	350, 724
Trifluoromethane, CHF ₃	99.995	44	70	32	635	44	205	93	660, 716
Difluoromethane, CH ₂ F ₂	99.995	44	90	41	207	14	215	98	350, 724
Octafluorocyclopentene, C ₅ F ₈	99.99	44	110	50	12	-0.8	235	107	660, 716
Methyl Fluoride, CH ₃ F	99.995	44	25	12	538	37	150	68	350, 724
*Alternate packages and purities available									

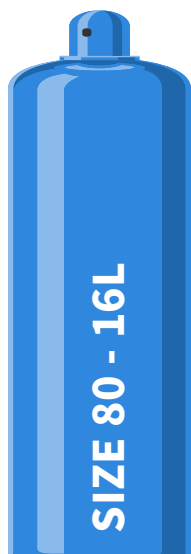
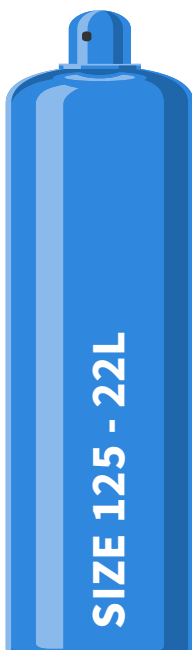
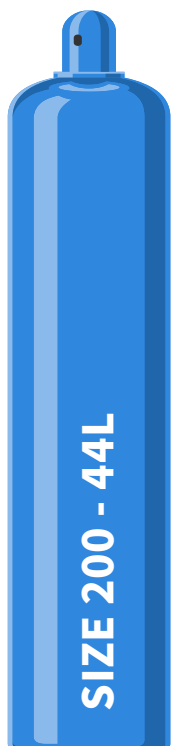
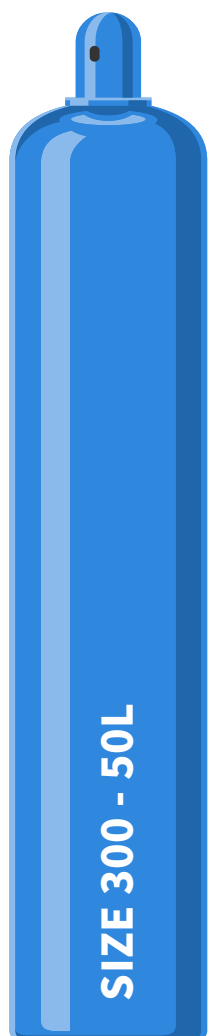


CYLINDER STANDARD PACKAGE INFORMATION FOR CH₃F



Cylinder Size	44L/Size200
Fill Weight	25lb/12kg
Valve Connection	CGA 350, DISS 724

Shipping Information	
DOT Name: Methyl Fluoride	
DOT Hazard Class	2.1
UN No.	2454
DOT (label)	Flammable Gas
CAS No.	593-53-3



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