Data in the following Table are from "Etch Rates for Micromachining Processing" by K. Williams and R. Muller (Journal of MEMS, Vol. 5, No. 4, Dec 1996)

Plasma- and Plasmaless-Gas-Phase-Etch Rates for Micromachining and IC Processing (A/min)

The top etch rate was measured by the authors and others in our lab with clean chambers, etc. The center and bottom values are the low and high etch rates observed by the authors and others under less carefully controlled conditions.

ETCHANT Equipment Condition	Target Material	SC Si <100>	Poly n+	Poly not doped	Wet Ox	Dry Ox	LTO not doped	PSG not annealed	PSG annealed	Stoic Nitride	Low Stress Nitride	Alum 2% SI	Sput Tung	Sput Ti	Sput Ti/W	OCG 820PR	Olin Hunt PR
CF_4+CHF_3+He (90:30:120 sccm)	Silicon oxides	W	1900 1400 1900	2100 1500 2100	4700 2400 4800	W	4500	7300 3000 7300	6200 2500 7200	1800	1900	-	W	W	W	2200	2000
CF_4+CHF_3+He (90:30:120 sccm) LAM 590 Plasma	Silicon oxides	W	2200 2200 2700	1700 1700 2100	6000 2500 7600	W	6400 6000 6400	7400 5500 7400	6700 5000 6700	4200 4000 6800	3800	-	W	W	W	2600 2600 6700	2900 2900 7200
SF_6+He (13:21 sccm) Technics PE II-A Plasma 100W,250mT,gap2.6cm.50kHz sq wave	Silicon nitrides	300 300 1000	730 730 800	670 670 760	310	350	370	610	480 230 480	820	620 550 800	-	W	W	W	690 690 830	630
CF_4+CHF_3+He (10:5:10sccm) Technics PE II-A Plasma 200W, 250mT, gap-2.6crm, 50kHZ sq. Wave	Silicon nitrides	1100	1900	W	730	710	730	W	900	1300	1100	-	W	W	W	690	600
SF_6+He (175:50 sccm) Lam 480 Plasma 150W,375mT.gap+1.35cm, 13.56MHz	Thin silicon nitrides	W	6400	7000 2000 7000	300 220 400	W	280	530	540	1300 830 2300	870	-	W	W	W	1500 1300 1500	1400
SF_6+He (175:50 sccm Lam 480 Plasma 250W,375mT.gap=1.35cm. 13.56MHz	Thick silicon nitrides	W	8400	9200	800	W	770	1500	1200	2800 2100 4200	12100	-	W	W	W	3400 3100 3400	3100
SF_6 (25 sccm) Tegal inline Plasma 701 125W, 200mT,40C nitrides	Thin silicon	W	1700	2800	1100 1100 1600	W	1100	1400	1400	2800 2800 2800	2300	-	W	W	W	3400 2900 3400	3100
CF_4+CHF_3+He (45:15:60 sccm) Tegal Inline Plasma 701 100W, 300mT, 13.56 MHz	Si-rich silicon nitrides	W	350	360	320	W	320	530	450	760	600	-	W	W	W	400	360

ETCHANT Equipment Condition	**Target Material**	**SC Si <100>**	**Poly n+**	**Poly not doped**	**Wet Ox**	**Dry Ox**	**LTO not doped**	**PSG not annealed**	**PSG annealed**	**Stoic Nitride**	**Low Stress Nitride**	**Alum 2% SI**	**Sput Tung**	**Sput Ti**	**Sput Ti/W**	**OCG 820PR**	**Olin Hunt PR**
Cl_2+He (180:400 sccm) Lam Rainbow 4420 Plasma 275W, 425mT,40C, Gap=0.80cm, 13.56MHz	Silicon	W 5000 5000	5700 3400 6300	3200 3200 3700	8 8	-	60	230	140	560	530	W	W	-	-	3000 2400 3000	2700
Hbr+$C1_2$ (70:70 sccm) Lam Rainbow 4420 Plasma 200W,300mT,40C, Gap=0.80cm, 13.56MHz	Silicon	W	450 450 740	460	4 4 10	-	0_2	0	0	870	26	W	W	-	-	350 350 500	300
Cl_2+$BC1_3$+CHC_3 (30:50:20:50 sccm) LAM 690 RIE 250W,250mT,60C,13.56MHz	Aluminum	W	4500	W	680	670	750	W	740	930	860	6000 1900 6400	W	-	-	6300 3700 6300	6300 3300 6100
SF_6 (80 sccm) Tegal Inline Plasma 701 200W, 150mT, 40C, 13.56MHz	Tungsten	W	5800	5400	1200 2000 2000	W	1200	1800	1500	2600	2300 1900 2300	-	2800 2800 4000	W	W	2400 2400 4000	2400
O_2 (51 sccm) Technics PE II-A Plasma 50W, 300mT, gap-2.6cm, 50kHzsq.wave	Descum-ming photoresist	-	0	0	0	0	0	0	0	0	0	0	0	0	-	350	300
O_2 (51 sccm) Technics PE II-A Plasma 50W,300mT.gap-2.6cm, 50kHz. Sq.wave	Ashing photoresist	-	0	0	0	0	0	0	0	0	0	0	0	0	-	3400	3600
HF Vapor 1 cm over plastic dish Room temperature and Pressure	Silicon oxides	-	0	0	660	W	780	2100	1500	10	19	A	0	A	P O	P O	P O
XeF_2 Simple custom vacuum Chamber. Room temperature 2.6 Torr	Silicon	4600 2900 100k	1900 1100 2500	1800 1100 2300	0	-	0	0	0	120 120 180	2 0 2	0	800 440 1000	290 50 380	-	0	0

Notation: - = test not performed; W = Not performed, but known to Work (100 A/min); F = not performed, but known to be Fast (10 kA/min); P = some of film Peeled during etch or when rinsed; A = film was visibly Attached and roughened.

Etch areas are all of a 4-inch wafer for the transparent films and half of the wafer for single-crystal silicon and the metals.

Etch rates will vary with temperature and prior use of solution, area of exposure of film, other materials present (e.g., photoresist), film impurities and microstructure, etc. Some variation should be expected.