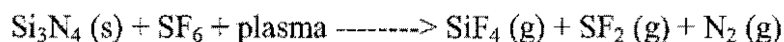
# Silicon Nitride Etch
# Application Note

| Material | Etch Gases | Reactive Species | By-product |
|---|---|---|---|
| Silicon Nitride | Freon 14 ($CF_4$) or $SF_6$ / 10% $0_2$ | Free fluorine | $SiF_4$ and $N_2$ |

Silicon nitride typically comprises the final passivation layer of an IC. It etches readily in plasmas that contain a lot of free fluorine (such as $SF_6/O_2$ or $CF_4/O_2$ plasmas). The $SF_6$ is isotropic by nature. However, in this case, this property is actually advantageous in removing the nitride sidewalls surrounding top metal.
The equation for this reaction is:



$Si_3N_4$ (s) + $SF_6$ + plasma --------> $SiF_4$ (g) + $SF_2$ (g) + $N_2$ (g)

A good starting recipe for nitride is:

| Parameter | Value | Comment |
|---|---|---|
| Pressure | 150-mTorr | Relatively high pressure = low voltage |
| RIE Power | 100-watts | Relatively low power = low voltage |
| $SF_6$ / $O_2$ | 45 / 5-sccm | Sufficient flow so $SF_6$ is not a rate limiting factor, with 10% oxygen helping accelerate the etch rate. |
| Etch Rate | 0.2-um/min | |

**For more information contact Trion Technology, Inc. (727)461-1888 · www.triontech.com**

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