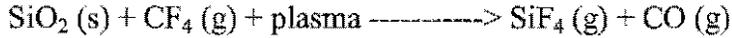


## Silicon Dioxide Etch Application Note

Material	Etch Gases	Reactive Species	By-product
Silicon Dioxide	CF <sub>4</sub> / 10% O <sub>2</sub>	CF <sup>3+</sup> , CF <sup>2+</sup>	SiF <sub>4</sub> and CO

There are many types of silicon dioxide in use today. They all etch in the same chemistry, however the recipes and etch rates vary a little with the type. Typically, highly doped oxides etch faster and oxides with high carbon content etch dirtier. The chemical reaction for this process is given below:



Silicon dioxide etching is intrinsically anisotropic due to the fact that the strong chemical bond between the silicon and oxygen requires ion bombardment to break.

A good starting recipe for top layer SiO<sub>2</sub> is:

Parameter	Value	Comment
Pressure	150-mTorr	Relatively high pressure = low voltage
Power	100-watts	Relatively low power = low voltage
CF <sub>4</sub> / O <sub>2</sub> Flow	45 / 5-sccm	Sufficient flow so CF <sub>4</sub> is not a rate limiting factor, with 10% oxygen helping accelerate the etch rate.
Etch Rate	0.15-um/min	

If an ILD (inter-layer dielectric) etch is desired where the ILD is SiO<sub>2</sub> a different process is recommended. The process relies on very low pressures to avoid grass formation. Running the process at lower pressures increases the Mean Free Path (MFP) and thus the IC's surface is bombarded with more reactive species that possess more energy. Low RIE power or voltage is used to maintain the IC's functionality and allow less heat build up on it. ICP power is used to maintain a relatively high etch rate by creating a HDP. This process is listed in the below table:

Parameter	Value	Comment
Pressure	5-mTorr	Very low pressure to reduce grass formation
Power (RIE / ICP)	30 / 350-watts	Relatively low RIE power = low voltage
CF <sub>4</sub> flow	25-sccm	Lower flow for less polymerization, and no oxygen so erosion or metal lifting does not affect the aluminum lines.
Etch Rate	0.1-um/min	

**For more information contact Trion Technology, Inc. (727)461-1888 • [www.triontech.com](http://www.triontech.com)**

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