

SOME INVESTIGATIONS INTO PLASMALESS DRY ETCHING OF SILICON AND  
ITS OXIDE WITH MOLECULAR FLUORINE

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Besides by the known plasma etching processes for silicon-based devices using halogen-containing gases, silicon can also be etched directly with molecular fluorine or with fluorine- containing compounds, e. g.  $\text{XeF}_2$ .

The reaction of silicon and its oxide with molecular fluorine was studied once more. In both cases gaseous  $\text{SiF}_4$  is formed as the reaction product which can be detected by infrared spectroscopy. At room temperature the observed etch rate for silicon increased linear with the  $\text{F}_2$  partial pressure, e. g.  $10 \mu\text{m/h}$  at 70 mbar of  $\text{F}_2$ . The ratio of  $\text{Si/SiO}_2$  etch rates is about 150. In the experiments maskless silicon pieces and  $\text{SiO}_2$  pieces show a uniform degradation of the material.

This etching technique was tested on different test structures. Photosensitive resist or silicon dioxide served as etch masks. The depths of the etched paths or trenches were measured with a microstylus and examined with a scanning electron microscope. The structures show an isotropic etch profile.