

## GaAs, AlGaAs ETCHING

via hole etch	Gases	.....BCl <sub>3</sub> .....	10 sccm
		SiCl <sub>4</sub> .....	30 sccm
		Cl <sub>2</sub> .....	5-15 sccm
		CHCl <sub>3</sub> .....	0-5 sccm
	Pressure	.....	15-20mT
	R. F.	.....	60-80W
	d.c.	.....	125-200V d.c.
	Susceptor	.....	Al <sub>2</sub> O <sub>3</sub>
	Endpoint	.....	time
	Gas Channels	.....0-100 BCl <sub>3</sub> .....	(BCl <sub>3</sub> )
		0-100 SiCl <sub>4</sub> .....	(SiCl <sub>4</sub> )
		0-100 Cl <sub>2</sub> .....	(Cl <sub>2</sub> )
		0-100 CHCl <sub>3</sub> .....	(CHCl <sub>3</sub> )
	GaAs etch rate	.....	0.5-1μm/min.
	Selectivity to mask (photo-resist)	.....	> 10:1
	Profile	.....	60°-80° slope

### POWER

Etch rate increases with increasing power but will decrease above approx. 100W. Etch profile is more anisotropic at higher power levels. Process is designed to run at low power to enable processing of wax mounted wafers without wax melting, and enable use of photo-resist mask.

### GAS FLOW

BCl<sub>3</sub> and SiCl<sub>4</sub> flows are none critical. Etch rate is dependent on Cl<sub>2</sub> flow: at higher flows profile becomes more isotropic and re-entrant. CHCl<sub>3</sub> is necessary if an inorganic mask is used. With a resist mask it's use depends on the extent of resist interaction which will vary with resist type and thickness. Addition of CHCl<sub>3</sub> makes the profile more anisotropic.

### ASPECT RATIO

The etch rate decreases as the aspect ratio of the via (depth/diameter) increases. In general, large vias etch faster than small vias and etch rate decreases with increasing depth. This must be allowed for when vias of different dimensions are present on one device.

Feature Etch	Gases .....	SiCl <sub>4</sub> .....	20 sccm
		BCl <sub>3</sub> .....	30 sccm
	Pressure .....		10-15mT
	R. F. ....		150W
	d.c. ....		250-300V
	Susceptor .....	Al <sub>2</sub> O <sub>3</sub>	
Endpoint .....		time (laser*)	

GaAs, AlGaAs etch rate .....	1500-2000Å/min.
Selectivity to mask (photo-resist) .....	4:1
Etch profile .....	anisotropic

This etch is designed to etch GaAs and AlGaAs at the same rate and is used to define features in multi-level GaAs/AlGaAs structures.

GAS FLOW

SiCl<sub>4</sub> is the main etchant and both GaAs and AlGaAs etch rates increases with increase in SiCl<sub>4</sub> flow. At higher flows, however, GaAs will etch faster than AlGaAs.

ENDPOINT

As there is no etch stop with this process etching is normally done on a time basis to achieve a given etch depth. If the mask is appropriate (approx. 50/50 open/masked area) then a laser can be used to monitor etch depths greater than approx. 2000Å.