Si_3N_4 DEPOSITION (LOW STRESS)

Gases	2% SiH_4 in N_2	300 sccm
	He	1200 sccm
	NH_3	3 sccm
Pressure		900mT
R. F.		40W
Temperature		250°-350°C
Electrode space		0.8-0.9"

Gas Channels	0-20 NH_3	(NH_3)
	0-1000 N_2	(SiH_4/N_2)
	0-2000 N_2	(He)
	0-1000 N_2	(N_2)

Si_3N_4 dep rate	60-100Å/min.
Si_3N_4 refractive index (n_f)	2.00 ± 0.02
Uniformity	< ± 3%
Etch rate in BHF(6:1)/20°C	< 800Å/min.
Stress	2X10^9 dynes/cm^2 tensile

GAS FLOW

The total reactive gas flow will influence both deposition rate and uniformity. If total rate is too low, uniformity will be poor. The refractive index of the deposited film is determined primarily by the SiH_4/NH_3 ratio: the NH_3 flow is normally adjusted to give a refractive index of 2.00. The ratio of He/N_2 will control the film stress. The film will become more compressive (less tensile) as He/N_2 ratio is increased.

POWER

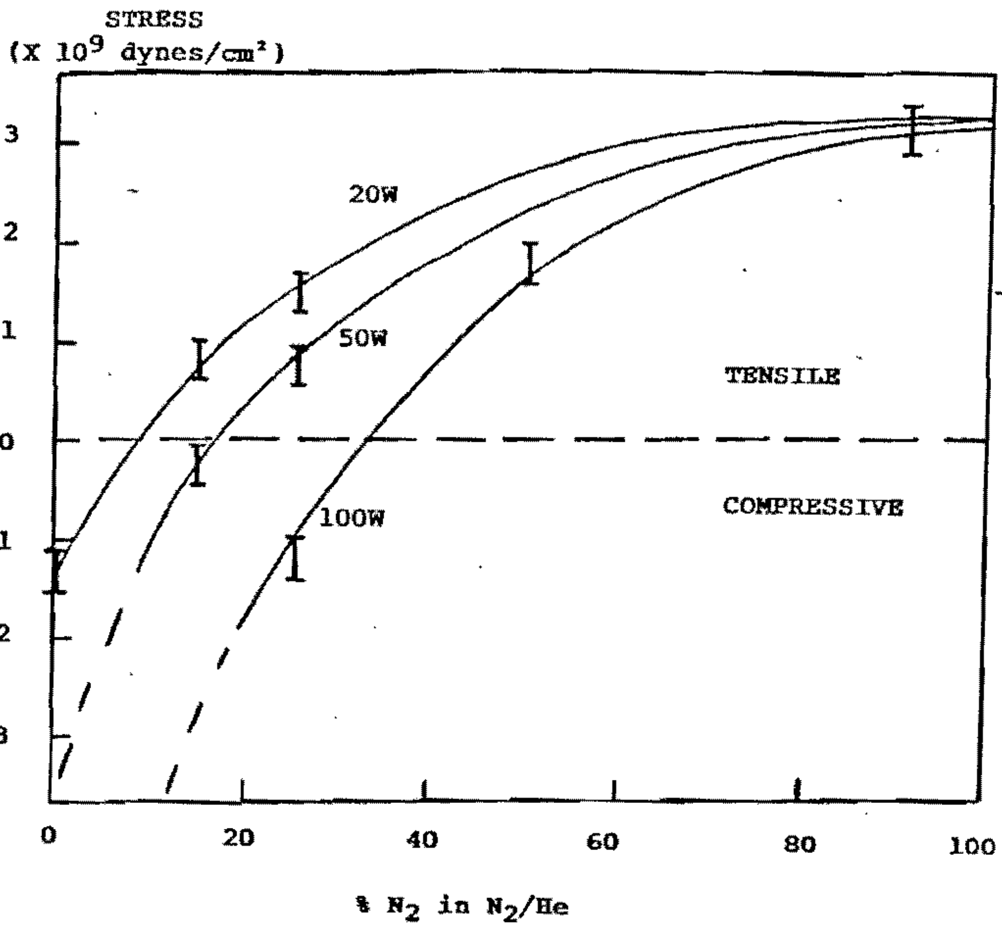
Power will affect primarily deposition rate, and film stress: large increases in power will affect uniformity. Increase in power will increase deposition rate and make the stress more compressive (less tensile). The change in stress is larger when the HE/N_2 ratio is large.

PRESSURE

For small changes (< 100mT), pressure has little effect on the process.

TEMPERATURE

Temperature is chosen primarily to be compatible with substrate material (e.g. 250°C for III IV materials, 350°C for Si). Slight changes in refractive index will occur with temperature change. BHF etch rate decreases with increasing temperature.



Variation of Si_3N_4 film stress with $[N_2]$