KOSTAS CENTER FOR MICRO AND NANOMANUFACTURING
AT NORTHEASTERN UNIVERSITY

Etch Rate Contour for PMMA using the Anatech Plasma Etcher

Experiment: PMMA was spun coated on silicon at **5000** rpm and backed at **180** °C for **90** sec. and etch in the Anatech plasma etcher at different powers and O_2 flows. Sample size was approximately 10 mm
Purpose: DOE to determine etch rate and dependences
Etch Gas: 100% O_2

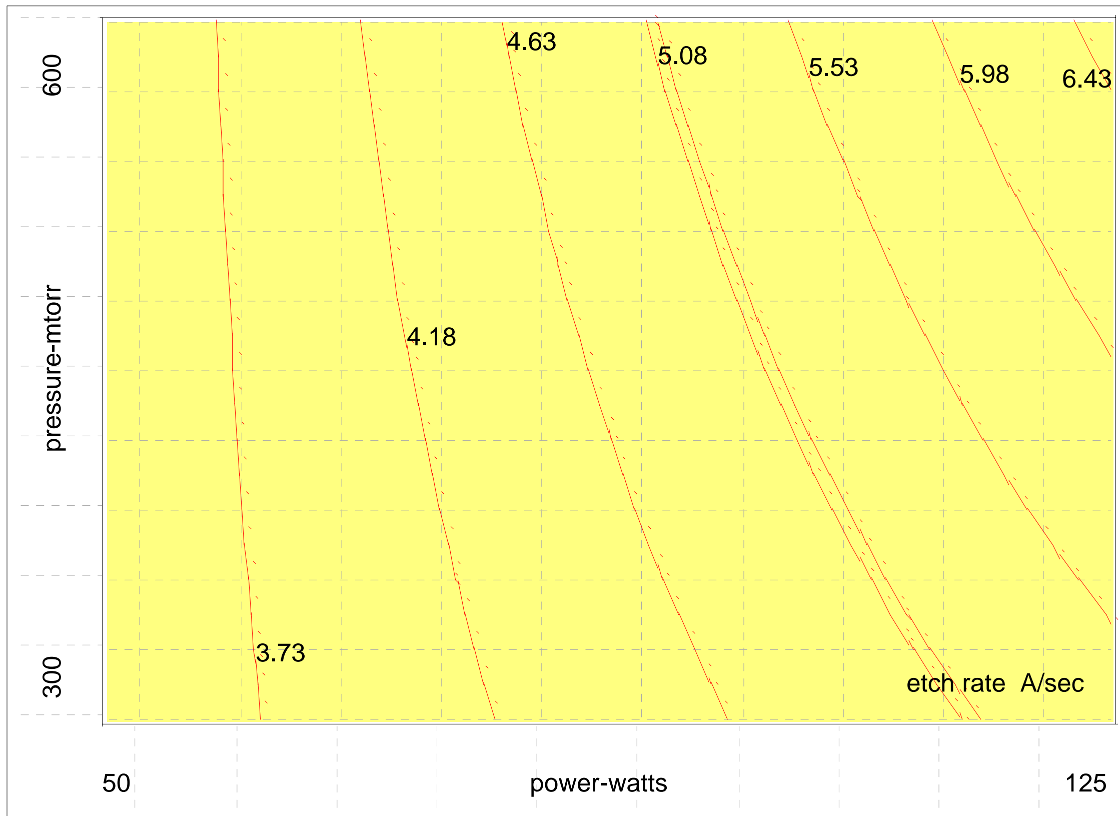

Figure 1 Etch rate contours. Each contour line is a line of constant etch rate. The combination of power and pressure along this contour will give the etch rate associated with that contour

Tabulated results (raw data) of Anatech PMMA etch DOE:
The table below was used to generate the contour plot above using JMP statistical software

Rich Devito /Dave Mckee 12/12/2008

Pattern	power-watts	pressure-mtorr	time-sec	etch rate A/sec	Pred Formula etch rate A/sec
000	87.5	450	120	5.05	4.677
-+-	50	600	60	3.28	3.247
+++	125	600	180	6.95	6.917
-++	50	600	180	3.33	3.5095
+-+	125	300	180	5.35	5.5295
--+	50	300	180	3.38	3.347
++-	125	600	60	5.98	6.1595
---	50	300	60	3.33	3.5095
000	87.5	450	120	4.89	4.677
+--	125	300	60	5.23	5.197

Table 1. Raw data from JMP input table
In the above table the software generates a formulae to predict the etch rate based on the input data. This plotted in the last column. The difference between the last two columns (actual etch rate verse predicted) indicates the goodness of the model.

Observation:

1. The model fits very well (with the exception of the first data point they are all within 5% or so if actual.

2. At low powers the etch rate is independent of pressure. At higher powers≥75 watts, there is increasing pressure dependence. Etch rate increases with pressure at higher powers