Stress Measurements and Rates in the Oxford PECVD

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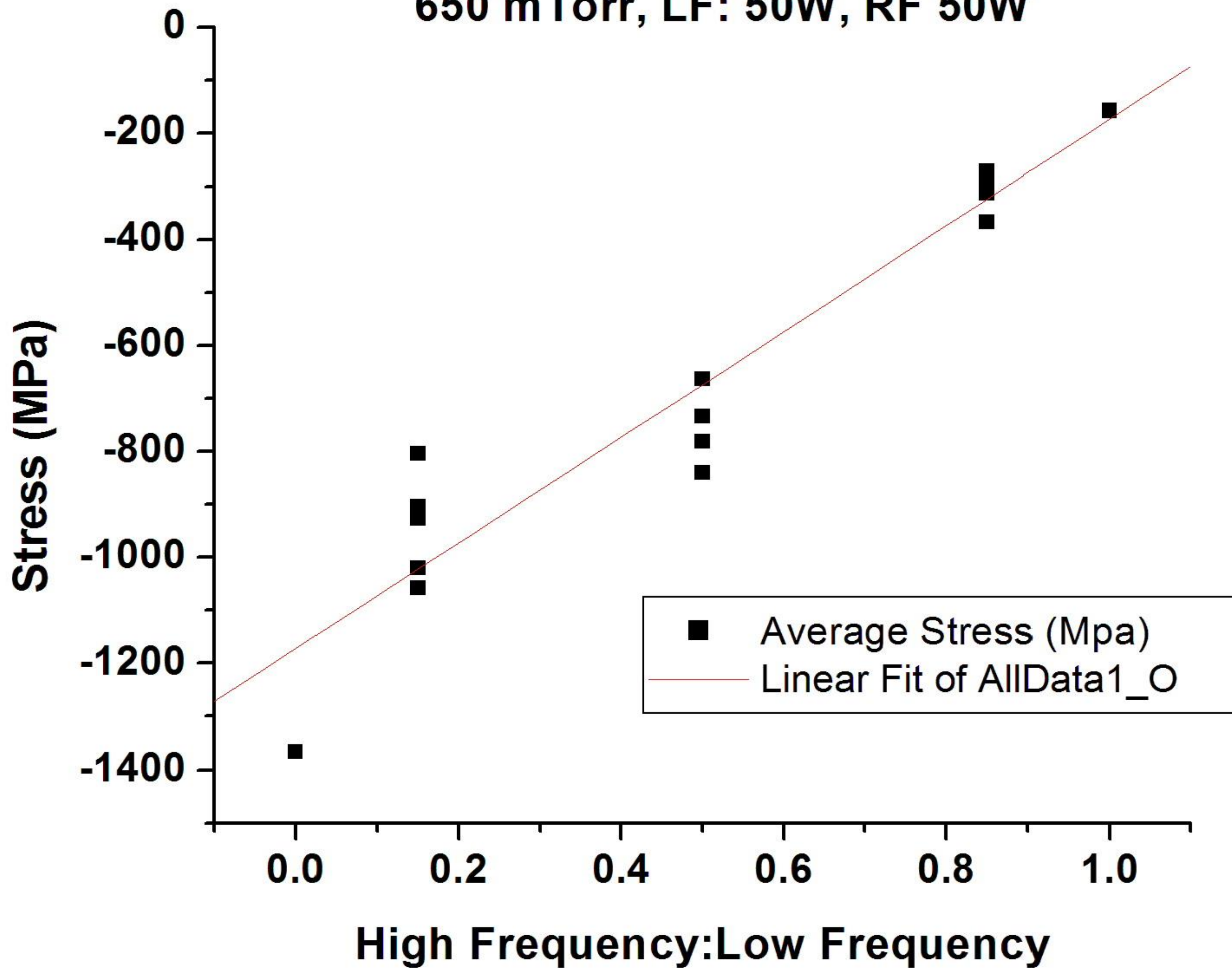
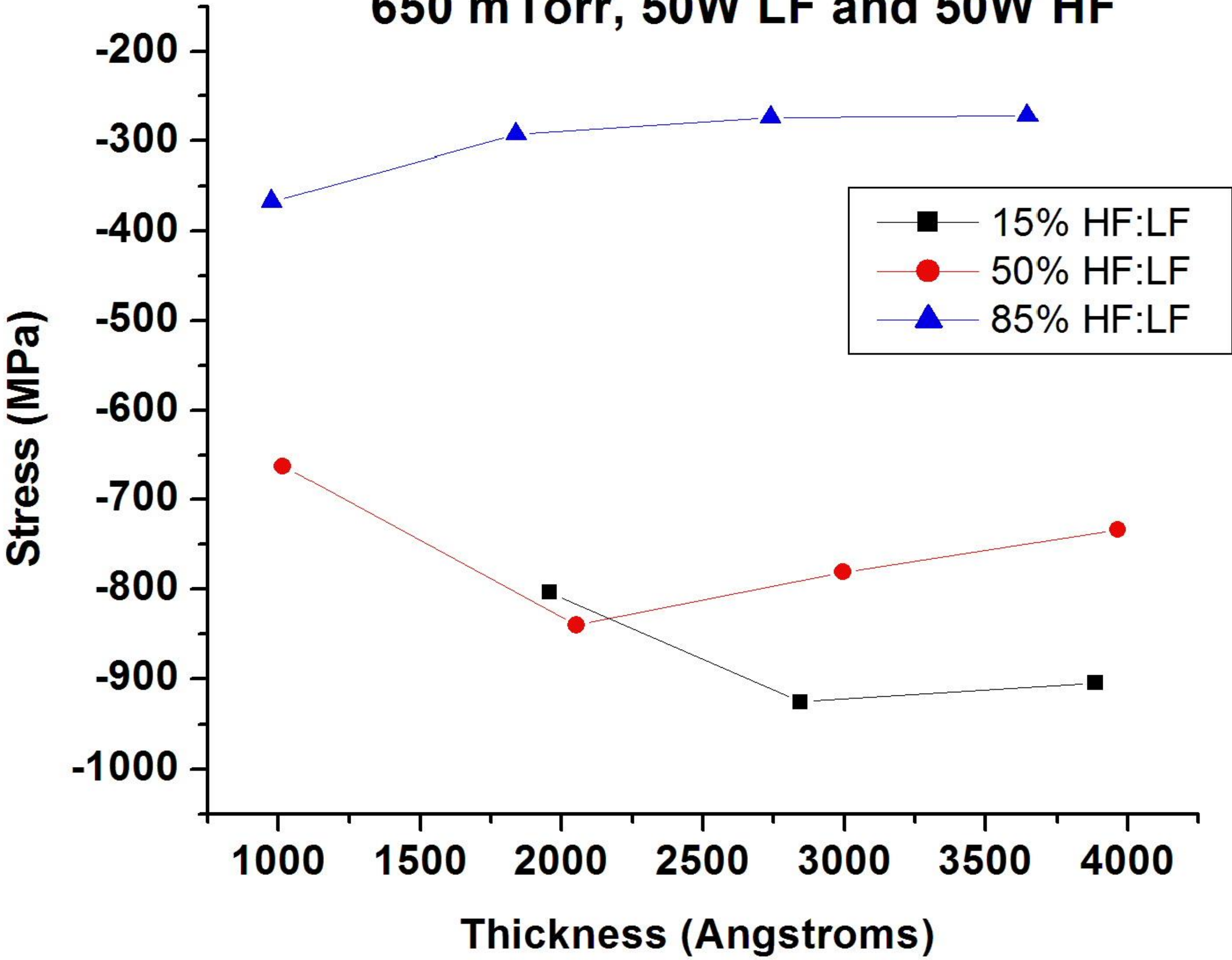
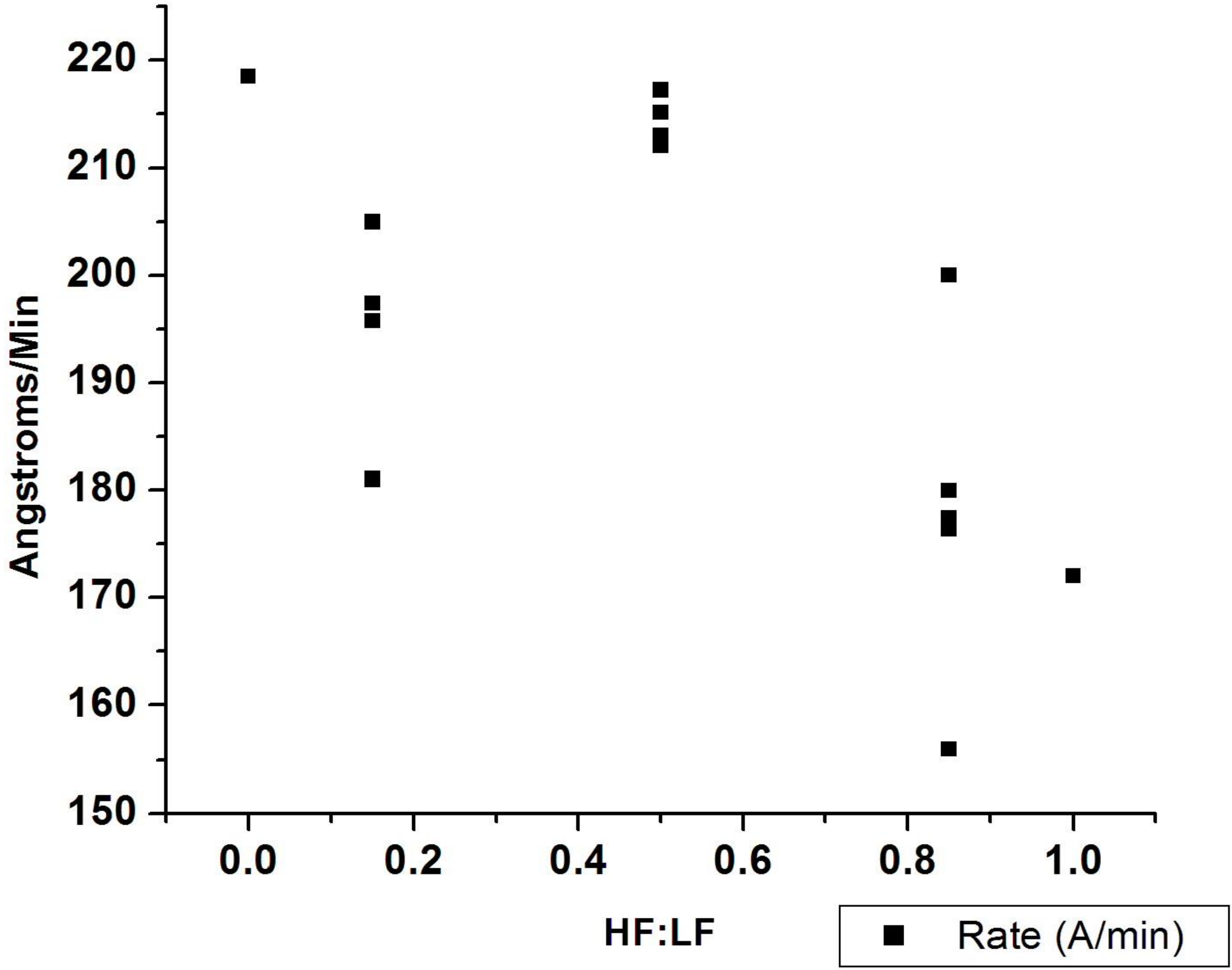
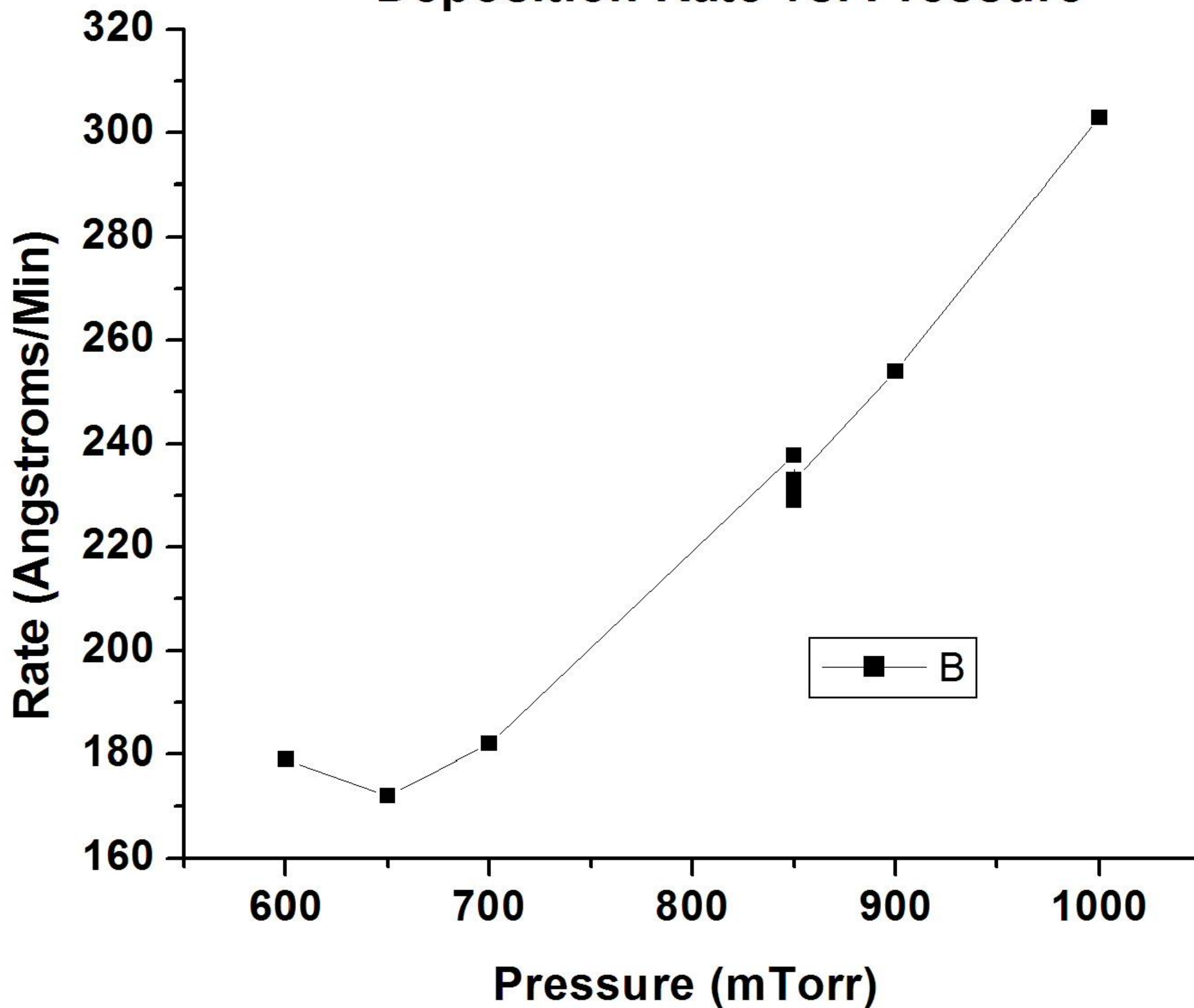
Motivation and Experimental

- The purpose is to provide characterization of stress and deposition information related to silicon nitride from the Oxford PECVD system
  - Data include: Stress vs. High:Low Frequency, Stress vs. Thickness, Deposition rate vs. Duty Cycle, Deposition rate vs. Pressure, Stress vs. Deposition Pressure
- Experimental Conditions
  - Walls at 70C, Transformer 1400
  - Pressure 450 – 1000 mTorr
  - Power 50 W for High Fequency (HF) and Low Frequency (LF)
  - Stress measured at 0,45,90 and 135 Degrees with respect to the flat
  - Gas flows in all experiments: 5% SiH_4/Ar: 400 sccm, NH_3: 20 sccm, N_2: 600 sccm


Stress vs. HF:LF Ratio
650 mTorr, LF: 50W, RF 50W
0
-200
-400
-600
-800
-1000
-1200
-1400
Stress (MPa)
0.0
0.2
0.4
0.6
0.8
1.0
High Frequency:Low Frequency
Average Stress (Mpa)
Linear Fit of AllData1_O


Thickness vs. Stress
650 mTorr, 50W LF and 50W HF
Stress (MPa)
-200
-300
-400
-500
-600
-700
-800
-900
-1000
Thickness (Angstroms)
1000
1500
2000
2500
3000
3500
4000
15% HF:LF
50% HF:LF
85% HF:LF


Silicon Nitride Deposition Rate vs. Duty Cycle
Angstroms/Min
220
210
200
190
180
170
160
150
0.0
0.2
0.4
0.6
0.8
1.0
HF:LF
Rate (A/min)


Deposition Rate vs. Pressure
Rate (Angstroms/Min)
320
300
280
260
240
220
200
180
160
600
700
800
900
1000
Pressure (mTorr)
B

Stress vs. Deposition Pressure
100% High Frequency