Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

***in-situ* FTIR characterization of the plasma chemistry as functions of the plasma duty cycle and peak power in a 1,3-butadiene discharge in an inductively coupled Gaseous Electronics Conference (GEC) Cell.** MATTHEW GOECKNER, ASHISH JINDAL, LAWRENCE OVERZET, University of Texas at Dallas — Time averaged *in-situ* Fourier Transform Infrared Spectroscopy is used to characterize the plasma chemistry of pulsed 1,3 Butadiene (H_2C=CHCH=CH_2) discharges as functions of both the plasma duty cycle and on phase power in a GEC Cell. Various ratios of plasma on to off times for equivalent duty cycles are investigated at peak powers of 40, 50, 60, and 70 W. Variations in densities associated with the major observed spectral bands are examined and the possible dissociation mechanisms responsible for all observed vibrations are investigated. For example, the data shows that free CH_2 stretching vibrations increase in a sub-linear fashion with increasing duty cycle. Approximately 44% of the CH_2 density is due to free daughter species at the largest (90%) duty cycle. This indicates that reaction kinetics are changing from cleavage of primarily the π bond of the C=C bond at lower duty cycles to cleavage of both π and σ (complete dissociation) at duty cycles approaching continuous wave biasing. This data will be tied to film growth.

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Date submitted: 19 Jun 2006 Electronic form version 1.4