

Abstract Submitted
for the GEC08 Meeting of
The American Physical Society

Negative Ion Extraction from a Pulsed NF₃ Plasma SVETLANA RADOVANOV, LUDOVIC GODET, RAJESH DORAI, VIKRAM SINGH, Varian Semiconductor Equipment Associates — Negative ions that are ordinarily trapped inside a plasma can be extracted during the afterglow period immediately following the end of a pulse. During this time the ratio of negative ions to electrons dramatically increases because of the electrons higher mobility, enabling them to reach the walls more promptly than the ions. In the later phase of the afterglow an ion ion plasma is formed and negative ions become the dominant negative charge carriers. In this paper we report time resolved measurements of negative ion energy distributions during the on and off period of a pulsed radio frequency inductively coupled discharge at pressures from 20 to 150 mTorr of NF₃, peak powers of 1-3 kW at pulse repetition frequencies between 1 and 10 kHz and duty cycles of 20 to 70%. We show a large flux of negative ions immediately following plasma turnoff. We find that RF pulse repetition frequency, duty cycle and power, can be adjusted to produce efficient negative ion formation. These parameters also control the transition from electron-ion to ion ion plasma. We also show a comparison to a Hybrid Plasma Equipment Model of the steady state plasma properties during the on period and comment on the transient effects observed.

Svetlana Radovanov
Varian Semiconductor Equipment Associates

Date submitted: 13 Jun 2008

Electronic form version 1.4