

## Plasma and surface diagnostics of silicon nitride thin film coatings generated by $\text{SiH}_4 + \text{NH}_3$ RF discharges.

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Although plasma processing in low pressure electric discharge reactors has become an extensive and critical step in the fabrication of microelectronic devices, its development has been carried out mostly empirically so far, by changing external reactor parameters in order to develop the best achievable film properties, whereas the intrinsic state of the plasma has been largely unknown [1, 2].

In this work, silicon nitride (SiN) thin films have been grown on silicon samples and on AlGaIn/GaN High Electron Mobility Transistors (HEMT) by Plasma Enhanced Chemical Vapor Deposition (PE-CVD). The SiN coatings have been produced in a RF discharge reactor, employing  $\text{SiH}_4$  and  $\text{NH}_3$  as precursors, at different electric powers and gas flow ratios. During depositions, the plasmas have been characterized by mass and time resolved quadrupole mass spectrometry, and the depletion ratios of parent gases have been observed. Afterwards, the refractive indexes and growth rates of the films have been analysed by ellipsometry, and their composition, by Fourier Transform Infrared Spectroscopy. The electrical characteristics and frequency responses of these films when deposited on HEMT (where they are just usually employed to passivate these devices against current collapses) have been studied too by means of DC, pulsed currents, and small signal RF measurements.

The plasma characteristics for the different deposition conditions have been correlated with the subsequent changes in the properties of the films. A comparison with the results previously reported in the literature is addressed.

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