

## ABSTRACT

Nitrogen  $N_2$  plasmas have been widely used to develop nitride thin film and several studies of  $N_2$  plasma revealed that the properties of deposited thin film depend on the relative flux of ionic and neutral species on the surface of substrate. Therefore, characterization of ionic and excited neutral species in  $N_2$  plasma generated by radio-frequency (RF) source is investigated by using optical emission spectroscopy (OES). It is observed that production of active species of  $N_2$  plasma has significant dependence on discharge parameters. Evolution of the selected emission intensities as a function of the pressure; power and inter-electrode distance are presented. The intensity ratio of the selected emission lines  $I(N_2^*) / I(N_2^+)$  and  $I(N_2^*) / I(N)$  are used to give the relative concentration of the nitrogen plasma species. Intensity ratio  $I(N_2^*) / I(N_2^+)$  is increased more compared to the  $I(N_2^*) / I(N)$ . This suggests that for the selected discharge parameters the relative concentration of ionic contents  $N_2^+$  are less than the atomic N and excited nitrogen molecule  $N_2^*$ . It is also observed from the results that there is more concentration of excited nitrogen molecule  $N_2^*$  as compare to N and  $N_2^+$ . These results are in agreement with the theoretical justification, when their excitation threshold energies are compared. The spectroscopy technique based on the measurement of relative intensities of two spectral lines of the same atom is used to evaluate the electron temperature.