# Abstract

The aim of this project is to study the formation of Cyanide in the graphite hollow cathode discharges. A graphite hollow cathode ion source was made to study the glow discharge using nitrogen and helium as filling gases. Graphite hollow cathode is used for the formation of carbonaceous discharge. The carbon is introduced into the system due to sputtering of the cathode surface, which is caused by the collisions of ionized gas molecules and atoms ($N_2^+$ and $He^+$). The discharge species i.e. He, C and nitrogen form a muti-component plasma in which higher carbon clusters ($C \geq 1$) are also present. The carbon formed due to sputtering interacts with nitrogen to produce CN, which acts as a fourth species in the glow discharge and has been used as useful indicator of the physical mechanisms of molecule dissociation and formation.

Emission spectroscopy is used to observe the formation of CN and the behavior of the multi-component plasma comprising of He, $N_2$, C and CN. An emission spectroscopy leads to the quantitative knowledge of the species forming the plasma in the form of excitation and vibrational temperatures. The discharge current $i_{dis}$ and the partial pressures of nitrogen and helium are the parameters which are changed in order to study the plasma at various conditions. By changing these parameters spectra are taken from the chart recorder. Data is analyzed for the level population of the atomic excitation levels in helium and vibrational levels in molecular nitrogen and CN. Thus evaluating the respective role played by various discharge parameters and the species in plasma with various constitution.