ABSTRACT
The influence of external electric field ranging from 3×10^3 V/cm to 7×10^3 V/cm, on X-rays emissions and surface morphology of laser ablated W plasma parameters has been investigated. For this purpose, metallic targets were exposed to Nd: YAG laser (1064 nm,10 ns,10 Hz) at constant irradiance of 1.6 GW cm^{-2}. For confinement purpose, targets were exposed to laser pulses under environmental conditions of Ar & Ne as background gasses at various pressures ranging from 5 Torr to 40 Torr. The results revealed that tungsten plasma parameters i.e electron temperature (T_e) and electron number density (n_e) initially show an increasing trend with increasing pressures under 25 Torr for Ar and Ne. Whereas, a decrease is observed at maximum pressure of 40 Torr. The enhancement in plasma parameters is attributed to confinement effects, with increase collisional excitations/de-excitations and ionizations. Without electric field, maximum values of T_e and n_e of W plasma are 16850 K & 1.06×10^{18} cm^{-3} respectively under Ar environment. Whereas, these values are 15700 K & 1.01×10^{18} cm^{-3} under Ne environment respectively. These values of T_e and n_e of W plasma under same experimental conditions are significantly enhanced in the presence of electric field. The values are 18750 K & 1.23×10^{18} cm^{-3} under Ar environment and 18100 K & 1.17×10^{18} cm^{-3} under Ne environment respectively. The enhancement in plasma parameters in the presence of electric field is attributed to the reheating/re-ionization of laser generated plasma by the flow of electric current through the laser generated plasma plume. The % age increase due to electric field in T_e is 11% & 15% whereas, % age increase in n_e is 16% & 15% for Ar and Ne environments respectively. In order to make a correlation between W plasma parameters and X-rays emissions, X-rays detection has also been performed in the presence and absence of electric field. The higher values of X-rays emissions are strongly corelated with enhanced plasma parameters in the presence of electric field. It was also observed that the surface morphology of tungsten (W) is strongly dependent on the electric field, leading to the formation of various surface features such as pores, beaded and agglomers. The surface morphology of W exhibits cracks, cavities, and irregular tracks formation un the absence as well as in the presence of electric field.