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ABSRACT

The energy flux to the substrate was measured in a hollow cathode magnetron (HCM) discharge. Feature of this discharge is high density plasma created in a large volume. The measurements of energy flux at different pressures and distances from the target are presented. As a result, at a distance greater than 20 cm from the target flux density is equal to hundreds mW/cm^2 for DC power supply of 2.1 kW. The energy flux increases linearly with discharge power and depends strongly on magnetic field geometry. Langmuir probe was used to study the spatial distribution of plasma parameters such as the electron density and temperature, plasma space and floating potentials. The temperature of Cu and Ar atoms and a deposition rate were measured with a Fabry-Perot interferometer and a quartz crystal microbalance respectively. Using data obtained the contributions from charged and neutral species to the total power density were determined. Comparison of the measured and calculated flows shows that the main contribution to the energy flux is created by the charged particles of the buffer gas. We also presented for comparing results of heat flux when the HCM was supplied by high power impulse magnetron sputtering (HiPIMS) source.

Keywords: Hollow cathode magnetron, energy flux, HiPIMS, Langmuir probe.

1. Introduction

Hollow cathode magnetrons (HCMs) are the plasma sources used for film deposition using metal atoms and ions. The HCM's cup-shaped target geometry electrostatically and magnetically confines electrons within the volume of the source so that losses are minimized. The characteristic difference