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A STUDY ON THE RELATIONSHIP BETWEEN PLASMA CHARATERISTICS AND FILM PROPERTIES FOR MgO BY PULSED DC MAGNETRON SPUTTERING

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Magnesium Oxide (MgO) with a NaCl structure is well known to exhibit high secondary electron emission, excellent high temperature chemical stability, high thermal conductance and electrical insulating properties. For these reason MgO films have been widely used for a buffer layer of high T_c superconducting and a protective layer for AC-plasma display panels to improve discharge characteristics and panel lifetime. Up to now MgO films have been synthesized by E-beam evaporation, Molecular Beam Epitaxy (MBE) and Metalorganic Chemical Vapor Deposition (MOCVD), however there have been some limitations such as low film density and micro-cracks in films. Therefore magnetron sputtering process were emerged as predominant method to synthesis high density MgO films. In previous works, we designed and manufactured unbalanced magnetron source with high power density for the deposition of high quality MgO films. The magnetron discharges were sustained at the pressure of 0.1mtorr with power density of 110W/㎠ and the maximum deposition rate was measured at 2.8㎛/min for Cu films.

In this study, the syntheses of MgO films were carried out by unbalanced magnetron sputtering with various O_2 partial pressure and specially target power densities, duty cycles and frequency using pulsed DC power supply. And also we investigated the plasma states with various O_2 partial pressure and pulsed DC conditions by Optical Emission Spectroscopy (OES). In order to confirm the relationships between plasma states and film properties such as microstructure and secondary electron emission coefficient were analyzed by X-Ray Diffraction(XRD), Transmission Electron Microscopy(TEM) and γ -Focused Ion Beam (γ -FIB).