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High rate deposition of MgO films by reactive magnetron sputtering with additional electron emission

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This paper investigated high rate deposition of MgO films for a protective layer in Plasma Display Panels by magnetron sputtering with Mg target and reactive O_2 gas. For this purpose, MgO films were deposited by 3 type of magnetron sputtering the one is a single Unbalanced Magnetron sputtering (UBM), the second is Cross-Field Unbalanced Magnetron sputtering (CFUBM) by a symmetrical arrangement of 4 magnetrons and the last is CFUBM with additional electron emission by W-filament. As magnetic cross-field and additional electron emission were employed to magnetron discharges of MgO, poisoning ratio was dramatically reduced and deposition rate of MgO film was increased at about 2.5 times compared to that deposited by a single UBM. Ion current density and intensity of plasma species measured by OES were increased as an engagement of magnetic cross-field and additional electron emission, which means that these play an important roll to multiply plasma density and ionization rate. As a results of microstructure analysis by AFM, TEM and ellipsometry, an employment of magnetic cross-field and additional electron emission lead to the decrease of surface roughness and the increase of film density, average grain size and transmission coefficient due to higher adatom mobility caused by increased plasma density.