Temperature dependence of discharge characteristics caused by MgO film in AC-Plasma Display Panels

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Abstract: *MgO film is one of the key parts to determine the discharge characteristics of the AC-PDPs. The work-function of the MgO film has been measured and published together with the crystal plane. Theoretically, the energy of Xe ions is not sufficient to emit secondary electrons from the MgO film. However, realistically, we observe the discharging phenomenon in the AC-PDPs. This phenomenon has been previously explained, introducing the F-centers in the MgO film. We observed the dominant process conditions to formulate the F-centers in the MgO film, and the temperature dependence of discharge characteristics caused by the MgO film properties. Moreover, we suggest an efficient method to correct the Mis-writing area in the conventional E-beam evaporated MgO film.*

1. Objectives and Background

It is well known that the discharge characteristics of the AC-PDPs are largely dependent upon the MgO film properties. There are several dominant process conditions for the MgO film coating on the dielectric layer to obtain stable and uniform discharge characteristics. The E-beam evaporated MgO film has oxygen deficient sites which form stable thermodynamic state, and trapped electrons at oxygen vacant positions exhibiting characteristic spectroscopic features. It is reported that Cathodoluminescence (CL) peaks were observed at 370nm and 520nm for F^+ and F-center on the MgO film. We observed the MgO film properties by changing process conditions to confirm which process condition is a dominant factor in forming the F-centers in the MgO film. In this paper, we will report the main factor for obtaining the desired MgO film, and the temperature dependence of discharge characteristics caused by the MgO film properties. We will also suggest an efficient method for the MgO film of the Mis-writing area to have normal discharge characteristics.

2. Experiments

The front and rear panels were manufactured by a conventional PDP manufacturing process. An MgO film was deposited on the dielectric layer using the E-beam evaporation method while process conditions were changed. Substrate temperature and oxygen flow rate were set as two variables. We observed the MgO film surface using SEM, and the crystallinity of the MgO films by XRD, then, we measured CL spectra to check the F-center differences in the MgO film properties according to the process conditions. Second, we investigated, by ESR, and CL measurement, the before/after aged MgO film surface for what was changed during the aging process. Third, we checked the electro-optical properties of the Mis-writing and normal area of the test panel that showed temperature dependence.

3. Conclusion

F-centers can be controlled by the E-beam evaporation process conditions. The Mis-writing areas on the same panel result from the different MgO film properties, and, as temperature is raised, show an amplified effect that is apparent to the naked eye. Radiation damaged MgO film causes the efficient formation of F-centers. Local Mis-writing phenomenon on the same panel can be modified by localized sputtering on the MgO film.

4. References

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