Influence of Temporal and Permanent Image Sticking Characteristics Under Variable Panel Working Gas Pressure in 42-in. AC-PDPs

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Abstract

The effects of the temporal and permanent bright image stickings were examined under variable panel working gas pressure in the 42-in. ac-PDP with a high Xe (11 %) content. In the cells with and without temporal and permanent bright image stickings, the display luminance, firing voltage, and Vt closed curve were measured relative to the working gas pressure. With a decrease in the working gas pressure, the temporal bright image sticking was observed to be reduced, whereas the permanent bright image sticking was observed to be deteriorated.

1. Introduction

The realization of a high-quality plasma display panel (PDP) requires an urgent solution to the image sticking and image retention problems induced in the PDP cells when strong sustain discharges have been repeatedly produced during a sustain period [1]-[3]. Image retention means a temporal image sticking that is easily recoverable, whereas image sticking means a permanent image sticking that is not recoverable. As such, this paper focuses on the effects of the temporal and permanent bright image sticking under variable panel working gas pressure in 42-in ac-PDP with a high Xe (11%) content. Our experimental observation illustrates that the variable panel working gas pressure is closely related to the temporal and permanent bright image sticking phenomenon. Accordingly, this paper investigates the relation between the temporal and permanent bright image sticking and the working gas pressure.

2. Experimental setup

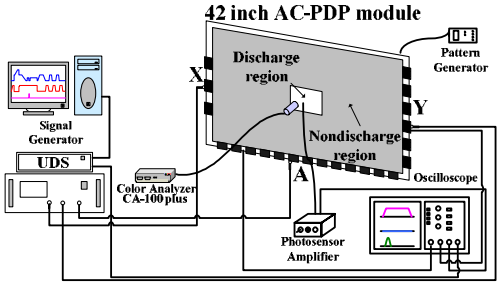


Fig. 1. Schematic diagram of experimental setup employed in this research.

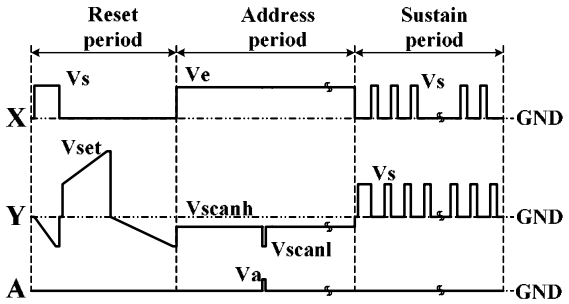


Fig. 2. Schematic diagram of conventional driving waveform used in this study.

Fig. 1 shows the optical measurement systems and commercial 42-in. ac-PDP module with three electrodes used in the experiment, where X is the sustain electrode, Y is the scan electrode, and A is the address electrode. A color analyzer (CA-100 Plus), a pattern generator, a signal generator, and a photosensor amplifier (Hamamatsu C6386) were used to measure the luminance, IR emission, and Vt closed curve, respectively. To produce the temporal and

permanent image sticking, the entire region of the 42-in test panel was changed to a full-white background immediately after displaying a square-type image (discharge region) at a peak luminance for about 60 s and 1000 h, respectively. Fig. 2 shows the driving waveforms, including the reset, address, and sustain periods, employed to compare the temporal and permanent bright image stickings of the variable panel working gas pressure. The frequency for the sustain period was 200 kHz. A driving method with a selective reset waveform was also adopted, and the gas chemistry in the experiment was Ne-Xe (11%)-He (35%). The different voltage levels of the driving waveforms were applied to each test panel due to the different firing condition, as listed in Table 1.

TABLE 1. Comparison of applied voltage levels under variable panel working gas pressure.

[V]	Vs	Vset	Vscanh	Vscanl	Ve	Va
100Torr	200	390	-49	-174	95	65
200Torr	187	373	-55	-180	95	65
300Torr	188	374	-60	-185	95	65
400Torr	197	386	-65	-190	95	65
500Torr	213	405	-70	-195	95	65
600Torr	219	414	-75	-200	95	65

3. Results and Discussion

Fig. 3 shows the changes in the temporal and permanent bright image stickings under variable panel working gas pressure. As shown in Fig. 3, as the working gas pressure was decreased, the temporal bright image sticking was observed to be reduced, whereas the permanent bright image sticking was observed to be deteriorated.

Figs. 4 (a) and (b) show the (a) changes in the luminance difference and disappeared time between the before and after discharge regions observed with full-white background after an iterant 60 s-sustain discharge of the temporal bright image sticking and the (b) changes in the normalized luminance between the before and after discharge regions observed with full-white background during an iterant 1000 h-sustain discharge of the permanent bright image sticking with a square-type image at peak luminance of the 42-in. test panel under variable panel working gas pressure. As shown in Fig. 4 (a), as the working gas pressure was decreased, the temporal bright image sticking was reduced. On the other hand, as shown in Fig. 4 (b), as the working gas pressure was decreased, the permanent bright image sticking was deteriorated.

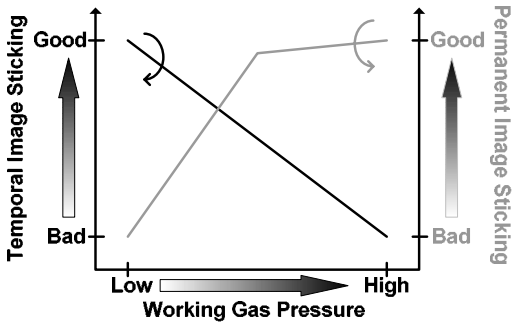
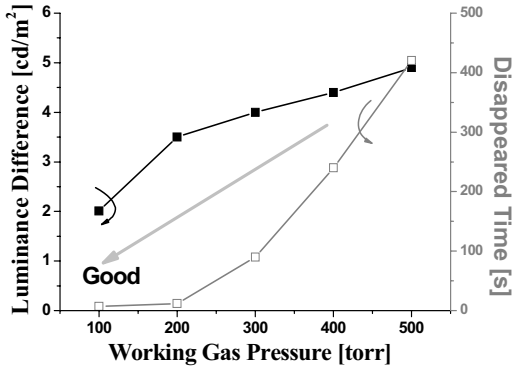
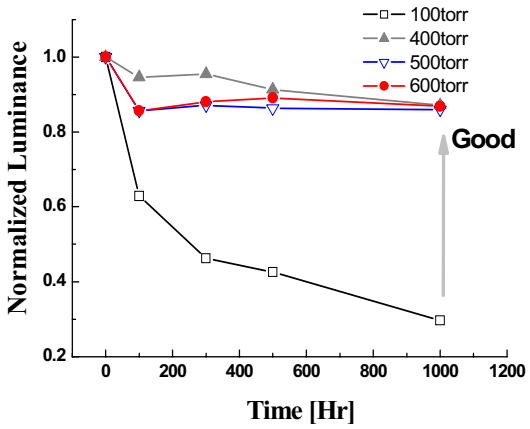


Fig. 3. Changes in the temporal and permanent bright image sticking under variable panel working gas pressure.



(a)



(b)

Fig. 4. (a) Changes in the luminance difference and disappeared time between the before and after discharge regions observed with full-white background after an iterant 60 s sustain discharge of temporal bright image sticking, and (b) changes in the normalized luminance between the before and after discharge regions observed with full-white background during an iterant 1000 h sustain discharge of permanent bright image sticking under variable panel working gas pressure.

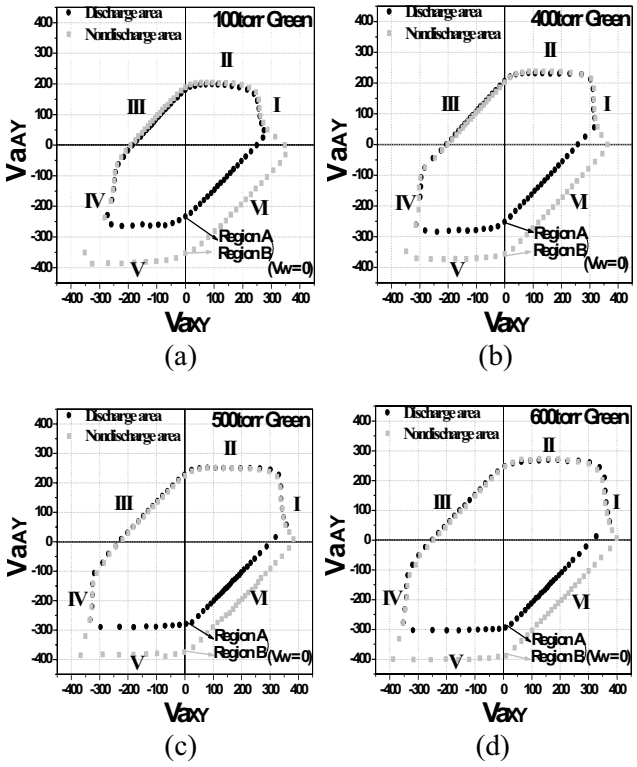


Fig. 5. Comparison of Vt closed curves for discharge and nondischarge regions without initial wall charges under variable panel working gas pressure. (a) 100 torr, (b) 400 torr, (c) 500 torr, (d) 600 torr.

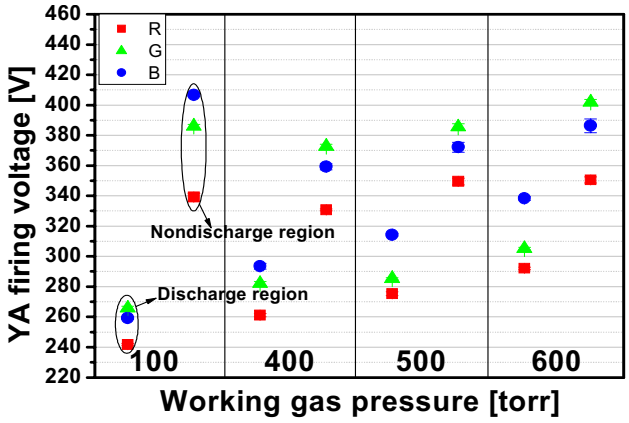


Fig. 6. Difference in the firing voltages of Y-A plate-gap discharges based on the Vt closed curve measured from discharge and nondischarge regions under variable panel working gas pressure.

To investigate the reason for deteriorating the permanent bright image sticking on the lower working gas pressure, the Vt closed curves were measured in the discharge and nondischarge regions on the green cells under variable panel working gas pressure, respectively. For discharge regions under variable panel working gas pressure, the firing voltages for sides I (X-Y), II (A-Y), III (A-X), and IV (Y-X) under MgO-cathode conditions were almost the same comparison in the nondischarge region, as shown in Fig. 5. However, the firing voltages for sides V (Y-A) and VI (X-A) under phosphor-cathode conditions were remarkably reduced. Fig. 6 shows the difference in the firing voltage of the Y-A plate-gap (side V, under phosphor-cathode condition) measured from discharge and nondischarge regions using Vt closed curve under variable panel working gas pressure. In the lower working gas pressure (100 torr), as shown in Fig. 6, the significant reduction in the firing voltage under the phosphor-cathode condition confirmed that a large amount of Mg species with a higher secondary electron emission coefficient was more deposited on the phosphor layer comparison in the higher working gas pressure caused by the more increased ion energy at lower working gas pressure. These experimental results showed that the deterioration of the permanent bright image sticking on the lower working gas pressure could be attributed to the more prohibition of a visible conversion from the vacuum ultraviolet of the phosphor layers caused by the more Mg species deposited onto the phosphor layers at the lower working gas pressure [2]-[3].

In conclusion, in the lower working gas pressure, the permanent bright image sticking was deteriorated due to the more prohibition of a visible conversion from the vacuum ultraviolet of the phosphor layers caused by the more Mg species deposited onto the phosphor layers at the lower working gas pressure.

4. Summary

Image sticking phenomenon in ac-PDP is a critical issue, so that the detailed research is needed to eliminate such a side effect completely. The effects of the temporal and permanent bright image stickings were examined under variable panel working gas pressure in the 42-in ac-PDP with a high Xe (11 %) content. In the cells with and without temporal and permanent bright image stickings, the display luminance, firing voltage, and Vt closed curve were measured relative to the working gas pressure. With a decrease in the working gas pressure, the temporal bright image sticking was observed to be reduced,

whereas the permanent bright image sticking was observed to be deteriorated. In this sense, this paper can contribute to giving a clue for reducing the temporal and permanent image stickings in ac-PDP.

5. References

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