Study on increasing durability of wrap around black material for tiled displays

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Recently, tiled display technology, which creates a large TV by attaching small panels in succession, has been receiving a lot of attention as an application for micro LED. One of the most important technologies to create a TV larger than 100 inches by attaching micro LEDs to a 10-inch panel is the wrap around electrodes and black overcoating technology that prevents the edges of each panel from being visible. In this paper, Ag paste and the Black overcoating material technology and process technology were described on the glass side using the pad printing method that can form a film on the curved surface. In particular, the low-resistance side wiring sintering method using Ag paste and the development of Black OC materials that are robust to high temperature and high humidity reliability conditions have laid the foundation for making ultra-large TVs using micro LED tiled displays in the future.

The black overcoated material must not only protect the Ag paste wiring well under external moisture and high temperature conditions, but also adhere well to the substrate. We were able to solve this problem by adding additives to the black material by applying the mechanism by which cement solidifies. Looking at Figure 1, the conventional material (sample B) easily peeled off during a high-temperature and high-humidity storage test, but the improved material (sample A) was able to firmly protect the Ag wiring. Equation 1 shows the pozzolanic reaction, and we were able to increase panel durability by applying this mechanism to the overcoated material of the titled display.

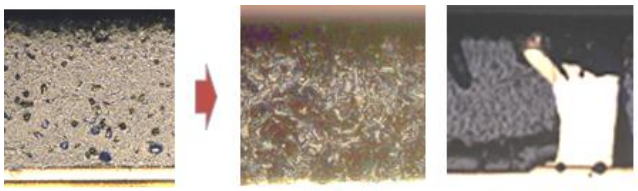

Fig. 1. High-temperature, high-humidity storage test results for two types of Black Overcated materials

Pozzolanic Reaction

$$CaCO_3\,(s) + heat \rightarrow CaO(s) + CO_2(g)$$
$$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2\,(aq) + 280\text{Kcal}$$
$$3Ca(OH)_2(aq) + 2SiO2(s) + 3H_2O(l) \rightarrow 3CaO, 2SiO_2, 3H_2O\ (s)$$

Equation 1. Pozzolanic Reaction

References

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