

In-plane Electrophoretic Displays Based on Oppositely Charged Dual particle Systems

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Abstract

Electronic ink based displays, also called electrophoretic displays (EPDs), a non-emissive device based on the electrophoretic phenomenon of charged electronic ink particles suspended in a low dielectric suspending medium and display images can be electrically written or erased repeatedly. [1-4] Positively charged white electronic ink particles [5-7] and negatively charged color electronic ink particles were loaded in a sandwich-type cell to form color and white images by applying bias voltages. (Figure 1)

In the image formation process, mixing an appropriate charge control additives positively charges the white electronic ink particles. On the other hand, the color electronic ink particles, which are negatively charged by the composite with the negative charge control additives in the polymerization step. The calculated response time of this process was about 150 ~ 200ms, which is much faster than that of the eye (0.1s).

Especially, the reflection densities of the black and white images were 0.94 and 0.38, respectively. (Figure 2) The maximum contrast was obtained when the total amount of loading was 10 mg and the weight ratio of the black electronic ink particles to the white particles was 5:5. (Figure 3)

This procedure makes possible rewritable in-plane electrophoretic imaging based on image recording and erasing by the action of an electric field. In addition, the memory effect exhibited by this display should be noted: When viewed through the upper transparent electrode, the blue image was retained even under an open circuit condition.

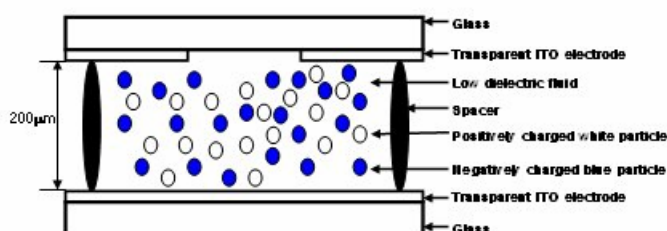


Figure 1 The representative cross section view of an electrophoretic display using negatively charged blue particles and positively charged white particles.

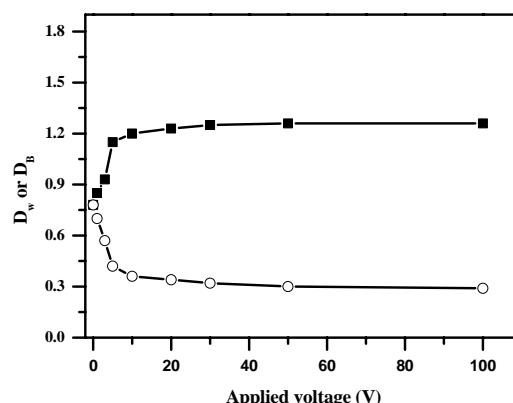


Figure 2 Relationships between optical reflection density and applied voltage. D_B and D_W stand for the density for the blue () and white () images.

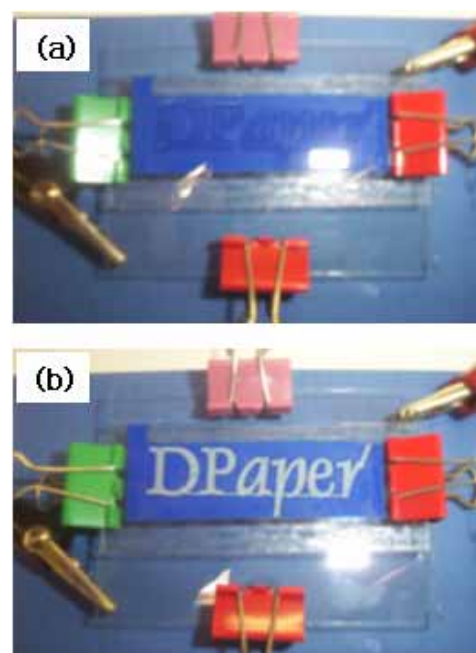


Figure 3 Photograph of an in-plane electrophoretic display cell: (a) no bias voltage applied, and (b) -20V applied and then removed applied voltage for 6hrs.

Reference

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