Double-Layer Fabry-Pérot Interferometric Modulator Display

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An interferometric modulator display characterized by double layers of liquid crystal (LC) Fabry-Pérot (FP) filters [1] is proposed. With this design, no polarizers and color filters are needed, and both color and amplitude can be tuned by electrically controlling LC's birefringence. Unlike the conventional RGB tri-subpixel color scheme, a bi-subpixel structure is adopted to render a super-wide color gamut. Based on the simulation, device performance is numerically evaluated, giving a proof that it is typically suitable for the green display application.

Figure 1 is a schematic drawing of the cross section of the proposed structure, where LC is sandwiched in between the two polyimide layers in tandem with reflective dielectric multilayer films and electrodes to form an FP filter. The overall transmission spectrum of two FP filters with a slip in transmission peaks will result in an intensity modulation of the transmitted light [2], as shown in Fig. 2(a). Moreover, two FP filters could further narrow the transmission bandwidth, so that the color purity of double FP filters with relatively low fineness can be improved as well. In order to tune the central wavelength of transmission peak within the entire visible regime (400-700 nm), the average refractive index will be adjusted by an applied voltage, as shown in Fig. 2(b), where it can seen that an LC material with a very large birefringence [3], which is nearly above 0.65, is required.

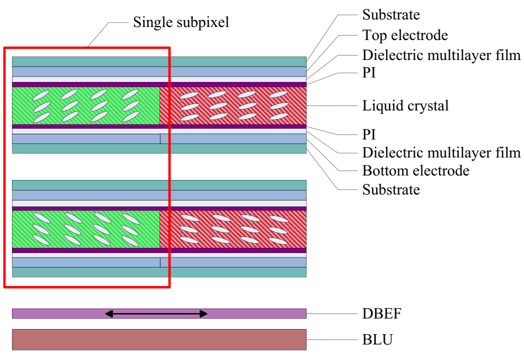
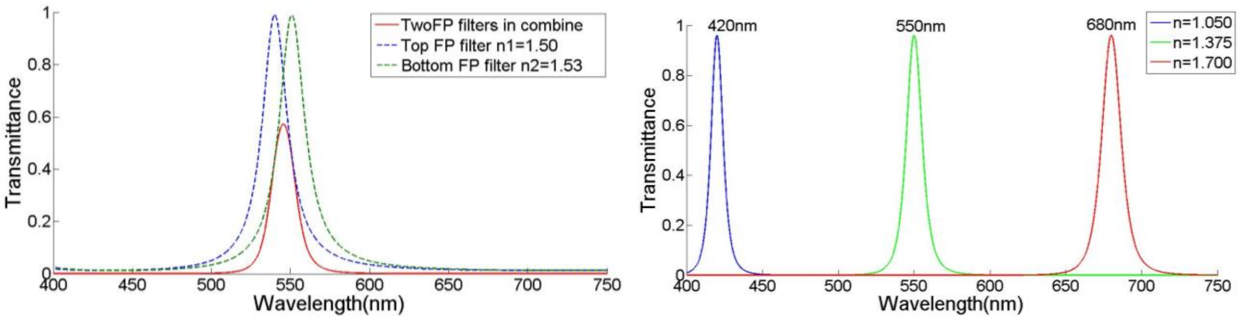


Fig. 1. Proposed structure for double-layer Fabry-Pérot interferometric modulator display.



(a) (b)

Fig. 2. Spectra of (a) intensity modulation and (b) wavelength modulation.

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References

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