# Full color reflective display based on high contrast gratings

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Reflective display requires no internal light source, this gives them unique properties such as printing-like looking, low power consumption, and readability under sunlight. Those properties make them suitable for a number of potential applications like e-book reader, signage, electronic shelf-labels and display for wearable devices[1]. So far, several approaches have been reported and commercialized on reflective displays, e.g., electrophoretic displays[2], electrowetting displays [3, 4], and cholesteric liquid crystal displays[5]. However, most approaches are still suffering from some common drawbacks, like low brightness, low color saturation and small gamut volume[1], therefore commercial reflective displays are still dominantly black-and-white only. To solve the issues, we proposed a full color reflective display design based on stacked "color mirrors" (figure 1), which could exhibit high reflectance with large gamut area, as well as the ability to modulate the reflectance[6].

The "color mirrors" are implemented using 2-D high contrast gratings (HCGs) (figure 2). They are fabricated by combining interference lithography and nanoimprint lithography (NIL). The modulation of the reflectance is achieved by changing the index contrast between the grating and its surrounding. Figure 3 shows the blue and green mirrors and their reflection spectra in ON and OFF states. High resolution pixels and the combinations of colors by mirror stacking will be presented too.

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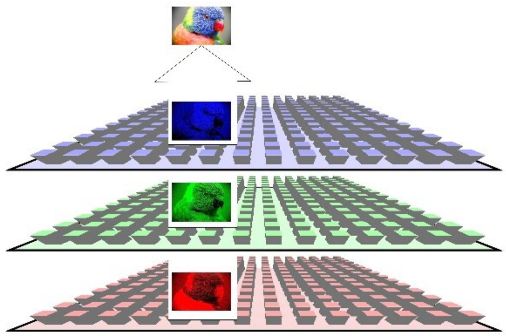

*Figure 1  Three-layer architecture of a full color reflective display. Blue, green and red filters are stacked, reflecting blue, green and red light, respectively.*

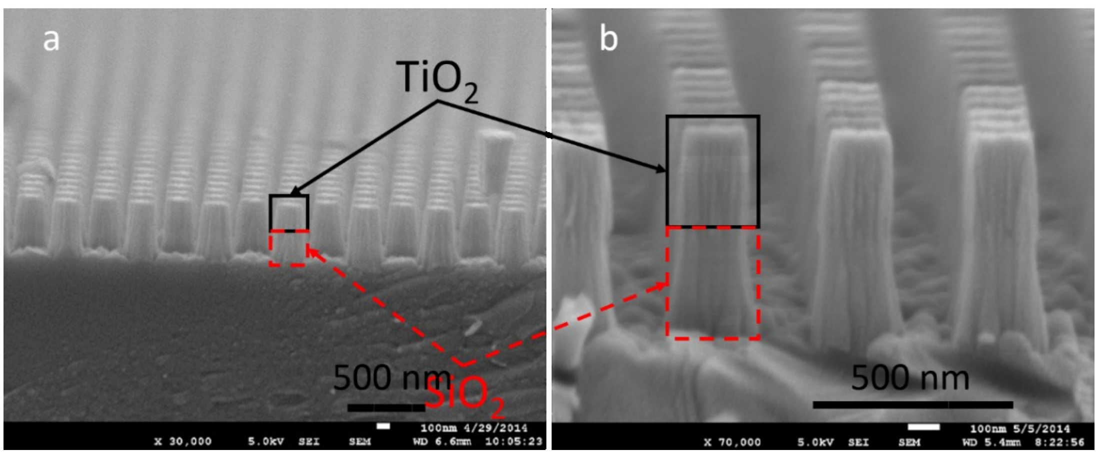


*Figure 2 (a) SEM image of the 2D subwavelength grating reflecting blue light. (b) SEM image of the green mirror.*

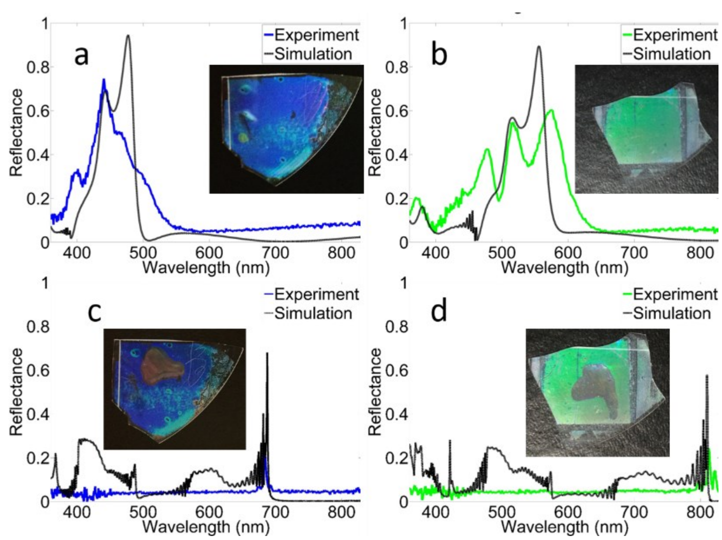


*Figure 3  Both experimental (color lines) and theoretical reflection spectra of blue (a&c) and green (b&d) mirrors in ON state (a&b) and OFF state (c&d). The inserts are optical photos of the color mirrors.*