[0053] Another object of the present invention is to reduce the number of steps in the process of making a reflective cholesteric liquid crystal color filter by reflecting two different bandwidths of light one bandwidth in the top portion of the layer and one bandwidth in the bottom portion of the layer.

[0054] Another object of the present invention is to eliminate the steps of aligning and gluing two layers together in making a reflective cholesteric liquid crystal color filter.

[0055] Another object of the present invention is to have stack several different polymerized states of cholesteric liquid crystal materials in one layer material.

[0056] Another object of the present invention is to provide a quarter wave plate integral with the reflective cholesteric liquid crystal color filter layer.

[0057] Another object of the present invention is to provide a reflective polarizer integral with the reflective cholesteric liquid crystal color filter layer.

[0058] Another object of the present invention is to stack multiple portions of polymerized cholesteric liquid crystal materials with different properties in each portion in one layer of cholesteric liquid crystal material.

[0059] Another object of the present invention is to develop material recipes for creating the reflective color filter made from the cholesteric liquid crystal that transmits red, green and blue from different sub-pixels with a two-layer configuration each of which has only two reflection bandwidths.

[0060] Another object of the present invention is to provide fabrication processing procedures for creating the reflective color filter made from cholesteric liquid crystals that transmits red, green and blue from different subpixels with a two-layer configuration each of which has only two reflection bandwidths.

[0061] Another object of the present invention is to polarize unpolarized incident light in reflection mode for a large bandwidth and a wide range of incident angles.

[0062] Another object of the present invention is to polarize unpolarized incident light in transmission mode for a wide range of angles and a large bandwidth.

[0063] Another object of the present invention is to analyze circularly polarized light for a wide range of angles and a large bandwidth in reflection mode.

[0064] Another object of the present invention is to analyze circularly polarized incident light in transmission mode for a wide range of angles and a large bandwidth.

[0065] Another object of the present invention is to transmit broadband polarized light without spectral distortions for a large range of angles.

[0066] Another object of the present invention is to compensate for the color change associated with using reflective CLC polarizers.

[0067] Another object of the present invention is to compensate for elliptical distortions of circularly polarized light in cholesteric liquid crystals when incident light is at large angles.

[0068] Another object of the present invention is to compensate for spectral distortions of circularly polarized light in cholesteric liquid crystals when incident light is at large angles.

[0069] Another object of the present invention is to compensate for elliptical distortions of circularly polarized light in cholesteric liquid crystals when the light is viewed at large viewing angles.

[0070] Another object of the present invention is to compensate for color distortions associated with polarization distortions of circularly polarized light in cholesteric liquid crystals when the light is viewed at large viewing angles.

[0071] Another object of the present invention is to compensate the severe degradation in polarization behavior at large incident angles associated with CLC-based broadband polarizers.

[0072] As a result of the present invention, improved LCD panels can be made having reflective color filters which offer significant advantages over absorptive color filters in that they reflect light for recycling in the system rather than convert the light to unwanted heat as absorptive color filters do. Such a reflective color filter system can enhance the brightness of the display and reach near 100% utilization efficiency. The efficiency derives from reflecting color filters which reflect light within the system for recycling rather than absorb the light.

[0073] By using reflective color filters of the present invention, the brightness of the LCD display is increased, the cooling systems needed to expel waste heat are eliminated, the power consumption is reduced allowing for smaller batteries and longer life per charge while reducing the weight and size of the display and lowing its cost.

[0074] In order to make simpler reflective color filters to transmit red, green, and blue for pixels in a display, an novel architecture for having two color reflecting portions per layer has been devised. In one embodiment only one film layer is needed because two colors can be reflected by the same film layer when the top part of the layer reflects one color and the bottom part of the film reflects another color.

[0075] In another embodiment, image displays are provided having three primary colors for color images, pixel arrays with three sub-pixels for transmitting blue, red and green are used. With a two layer system blue and green reflective layers transmit red, red and blue reflective layers transmit green, and green and red reflective layers transmit blue. Clear sub-pixels transmit the colored light incident thereon. The clear sub-pixels can reflect ultraviolet and infrared light.

[0076] In other embodiments of the present invention, if a portion of a broadband layer reflecting blue and green is paired with a portion of a layer which is clear, then red light is transmitted. When a portion of a broadband layer reflecting green and red is paired with a portion of a layer which is clear blue is transmitted. When a portion of a layer which is blue reflecting is paired with a portion of a layer which is red reflecting, green is transmitted. When the green and red portion in one layer overlaps part of the blue portion and part of the blue and green portion in the other layer, a black matrix is formed in the overlap portion.