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Cholesteric Liquid Crystal Based Reflex Color Reflective Displays

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Bistable color cholesteric liquid crystal displays are unique LCDs that exhibit high reflectivity, good contrast, extremely low power operation, and are amenable to versatile roll-to-roll manufacturing. The display technology, now branded as Reflex^{TM} has been in commercialized products since 1996. It has been the subject of extensive research and development globally by a variety of parties in both academic and industrial settings. Today, the display technology is in volume production for applications such as dedicated eWriters (Boogie Board^{TM}), full color electronic skins (eSkin), and displays for smart cards. The flexibility comes from polymerization induced phase separation using unique materials unparalleled in any other display technology. The blend of monomers, polymers, cross linkers, and other components along with nematic liquid crystals and chiral dopants is created and processed in such ways so as to enable highly efficient manufactrable displays using ultra thin plastic substrates – often as thin as 50μm. Other significant aspects include full color by stacking or spatial separation, night vision capability, ultra high resolution, as well as active matrix capabilities. Of particular note is the stacking approach of Reflex based displays to show full color. This approach for reflective color displays is unique to this technology. Owing to high transparency in wavelength bands outside the selective reflection band, three primarily color layers can be stacked on top of each other and reflect without interfering with other layers. This highly surprising architecture enables the highest reflectivity of any other reflective electronic color display technology. The optics, architecture, electro-topics, and process techniques will be discussed. This presentation will focus on the physics of the core technology and color, it's evolution from rigid glass based displays to flexible displays, development of products from the paradigm shifting concepts to consumer products and related markets. This is a development that spans a wide space of highly technical development and fundamental science to products and commercialization to enable the entry of the technology into consumer markets.