Panasonic improves LCD contrast

Panasonic Liquid Crystal Display Co. Ltd., the display manufacturing arm of the Japanese electronics giant, Panasonic, has recently announced a liquid crystal display (LCD) capable of achieving contrast ratios which rival organic light-emitting diode (OLED)-based displays [1]. Typically, OLED displays have achieved better contrast ratios – brighter whites and darker blacks – than the more traditional LCD due to the fact that the emitted light can be controlled on a per-pixel basis. LCDs, on the other hand, rely on backlights to illuminate the display, which cannot be controlled at such a small scale. Panasonic’s new display is an industry first for in-plane switching LCD technology, achieving a contrast ratio of 1,000,000:1. While many consumer displays boast a ‘dynamic contrast’ at a similar level, this number touted by Panasonic refers to the ‘static contrast’, which is irrespective of backlight and is typically closer to ~2000:1 for most LCDs.

Other recent technologies have utilised quantum dots to enhance the contrast of LCDs [2]. This new product from Panasonic, however, features a new architecture which inserts an additional light modulating layer between the backlight and the display cell of the device. While details are vague, the new light modulating layer is said to be liquid crystal based, yet with different light transmittance properties from the display cell itself. The result is a display with improved control of the brightness per pixel, reducing light leakage while maintaining features such as viewing angle. The technology can also be manufactured with traditional LCD production techniques.

This new monitor is designed for professional high-dynamic range applications, such as broadcasting, video editing and even in medical uses – where accurate colour reproduction can be of great importance. Panasonic hope to begin shipping display samples in January 2017.

Liquid crystal sensors

Liquid crystal (LC)-based sensors are a promising means to detect a variety of different chemicals, from viruses to explosive compounds. A major advantage of an LC-based sensor tends to be the low cost of the final product; however, development time can often be a long and laborious task. A University of Wisconsin-Madison collaboration between Prof. Manos Mavrikakis and Prof. Nicholas L. Abbott has sought to develop a framework that could prove important in the rapid development of such sensors [3].

LC sensors typically work by anchoring nematic LCs onto a functionalised substrate which, in the presence of a particular chemical, will alter the LC alignment. Any changes to the LC anchoring can be detected by analysing transmitted light through the device, thus providing a sensitive chemoresponsive system. While this technique has been successfully used to make a variety of sensors, the experimental screening required to design complex sensors capable of detecting multiple chemicals or biological molecules is time-consuming and hinders development of such devices.

The new collaboration leverages Mavrikakis’ expertise in computational chemistry alongside Abbott’s experimental expertise in the area to develop a model which vastly reduces the experimental trial and error necessary to develop LC sensors. The work, reported in Nature Communications [4], demonstrates how computational modelling is used to greatly narrow down the number of candidates to be tested via experiment. This new framework can hopefully be used to streamline the rapid development of sensors for a wide range of applications, from food hygiene to air quality.

Roll-up LCD

Flexible displays capable of being rolled up are a hot topic of research due to the versatility and portability of such a device. Until now, research in this field has
tended towards the use of OLEDs. While advances in recent years have shown such devices to be promising, the flexible substrates often contain poor gas-barriers, leading to degradation of the display material over time. New research, led by Professors Hideo Fujikake and Takahiro Ishinabe of Tohoku University, Japan, has demonstrated that an LC-based device can be fabricated into a flexible display with the advantage of showing minimal degradation over time [5].

While traditional LCDs are formed on rigid glass substrates, this new device sandwiches an LC layer between ultrathin polyimide substrates which contains robust polymer wall spacers. A typical LCD when bent would display a distorted image, since bending would cause the LC layer to become non-uniform. The new structure utilises the robust polymer spaces to ensure a device thickness of 10 μm is maintained, and tests have shown that uniformity is held in the device even when rolled to a radius of 3 mm.

Much work still needs to be done on the device, which was initially announced at the Society for Information Display’s Display Week 2016. Addressing individual pixels is one of the next tasks, since thin film transistor technology is not easily translated onto flexible substrates, as well as the important step of developing a flexible light-guiding sheet which can be used as the backlight.

Disclosure statement
No potential conflict of interest was reported by the author.

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