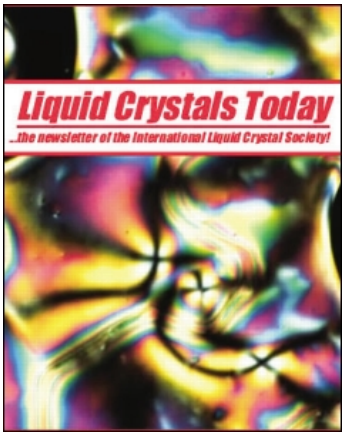

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Liquid Crystals in Industry III

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NEWS

Liquid Crystals in Industry III

1. Samsung and LG pave the way for 3D televisions

Over the past two years the increasing popularity of 3D screenings in cinemas around the world has led to a number of companies increasing their ambitions for delivering such technology to the home. The current surge in public interest in 3D viewing is explicitly evident in the success of a number of films, none more so than Avatar, available in both standard viewing and 3D for an extra cost; almost 80% of UK cinema goers choose to pay the extra and wear the polarising glasses. Even though they are much more expensive to produce, in 2010 over 20 films will be made in 3D, double the amount from 2009.

It is therefore of little surprise that the liquid crystal display (LCD) giants of Samsung and LG have both recently announced that they aim to sell 2.6 million and 3.4 million, respectively, of their new 3D liquid crystal televisions by the end of 2010. Already available in South Korea, these displays made their way to the UK in the summer with the aim of ousting high-definition displays in the average living room. Such an ambitious aim is made more realistic by the collaboration of companies such as Samsung with Sky who are launching their new 3D satellite TV service in October. It will come as a surprise to most that standard Sky boxes are already capable of receiving the signals that would be sent for 3D broadcasts and no extra equipment except a 3D television would be needed, removing one of the potential stumbling blocks to such a proposal. It is hoped that the introduction of these displays will spark much needed growth in a sector that has been through hard times, as Gary Shapiro the president of the Consumer Electronics Association summed up at an annual tech gathering: '2009 is a year none of us want to repeat'. With Panasonic and Sony also piling money into the development of 3D displays, it will be essential that the 3D gamble pays off.

2. 3D display without the need for polarising glasses?

One of the possible drawbacks to the concept of a 3D television in the home is that some people are uncomfortable with having to wear the currently necessary polarising glasses. Hope has been gifted to such individuals, however, by a recent 3D 'no glasses needed' device by Texas Instruments exhibited at the Mobile World Congress (MWC) hosted in Barcelona in February 2010. The tablet sized prototype is currently intended only for mobile phone displays but it will surely catch the attention of all other display types imminently.

It works by integrating a standard 120 Hz LCD and an overlay film from 3M that directs alternating images to the left and the right eye of the user essentially at 60 Hz each. Another result of this seemingly simple set-up is that at any point the display can be reverted back to standard 2D viewing. Visitors of the MWC commented that static images did indeed have a significant amount of depth although the 3D video shown on the display was not as convincing. It is clear, however, that a lot of interest was generated by this product.

Nintendo have developed a 3D hand held games console thought to be based on a similar type of technology, currently named the 'Nintedo3DS'. A working prototype was unveiled at the E3 conference in June and received a strong positive reaction. The release date is currently speculated to be around November 2010, and it is also hoped that the release will be global rather than initially only available in Japan.

3. Pressure sensitive touch-screen LCD's powered by quantum mechanics

Quantum mechanics has for the best part of 100 years been a topic that physicists have taken great interest in, resulting in many theories and active areas of research. For lecturers teaching the subject, however, it has often been difficult to justify to students any practical applications to areas such as the Schrödinger equation, the Heisenberg uncertainty principle and quantum tunnelling. A small UK-based company called Peratech has solved such a problem by sealing a $1.4 million deal to licence its pressure sensitive touch-screen technology that utilises quantum tunnelling to the Japanese screen manufacturer Nissha.

So how does it work? Quantum mechanics shows that electrons have a wave-particle duality and that when a wave meets a potential barrier that there is a finite probability that it can 'tunnel' through even if the electron has less kinetic energy than is required classically. Using a cleverly shaped conductive spiked sphere

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(imagine a curled up hedgehog) the apparent width of the quantum tunnelling barrier is lowered due to the high charge density at the tips of the spikes and this allows conduction to occur. As the material is compressed the spikes from adjacent particles are brought closer together and the probability of quantum tunnelling increases exponentially leading to a measurable exponential decrease in the electrical resistance. When the pressure is removed an elastomer binding ensures the structure returns to its original configuration.

Standard 'pressure sensitive' touch-screen LCDs that are currently on the market are only able to provide a few levels of sensitivity, and typically such capacitive screens work on the principle that a fixed charge on the screen is altered by the application of an external electrical charge (i.e. an ungloved finger). It is claimed that these new LCDs utilising the Peratech technology can detect distortions in the surface of the display with a resolution of just 2 μm, giving rise to a massively increased number of potential sensitivity levels and opening the door to further applications. Products utilising this technology will be released as early as April 2010 and depending on their progress a succession of further devices will surely emerge later this year.

4. 'Touchless' touch-screen technology

In the highly competitive world of consumer electronics companies are being forced to become more and more innovative with their products, and even revisit well-established technologies such as touch-screen technology (as already shown in the previous section). A consequence of this is the emergence of elegant technologies such as 'touchless' touch-screen technology. Many companies have already produced products that implement such technology via the use of an optical camera such as the Sony EyeToy and more recently also utilising magnetic strip detection such as with the HP Wall of Touch. All of these technologies, however, require additional components than just a LCD but Ramesh Raskar, a researcher at the Massachusetts Institute of Technology, decided to try and come up with a neat solution.

A new generation of LCDs known as optical liquid crystal displays are now emerging that have light sensors implanted in-between the pixels of the screen. The backlight has a specific off-state between each frame resulting in a dark state that is invisible to the naked eye but enables the light sensors to pick up light from the surroundings. Through the use of software that treats each sensor as a pinhole camera a 3D image can be generated enabling external gestures such as a hand moving to result in a command such as moving an item on the screen to a high accuracy. This is known as a BiDi (bi-directional display interface) due to the fact the liquid crystal pixels allow light to pass from the backlight to the surroundings as well as allowing the transmission of external light that passes through to the optical sensors.

Although a working model has yet to be put onto the market it is surely only a matter of time until such an inventive product emerges onto the scene and becomes a commonplace piece of technology. This will come as a major relief to those who cringe at the marks and smears left on their touch-screen equipment by negligent friends!

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