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47th SID International Symposium, 31 May - 5 June 2009, San Antonio, USA

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CONFERENCE REPORT

47th SID International Symposium, 31 May – 5 June 2009, San Antonio, USA

The 47th SID International Symposium, Seminar and Exhibition (Display Week 2009) was held at the Henry B. Gonzalez Convention Center in San Antonio, Texas, USA from 31 May to 5 June 2009. This year's Display Week consisted of the exhibition, the symposium and the usual set of instructive lectures including short courses, seminars and applications tutorials. The exhibition was held over three days and featured about 200 companies specialising in display electronics, components, systems, services, manufacturing equipment and applications. The symposium featured three keynote addresses, 292 invited and contributed talks in 67 technical sessions and 201 poster presentations.



The symposium started with three keynote addresses. Dr In-Jae Chung (Executive Vice-President and Chief Technology Officer, LG Display Co, Ltd, Korea) began his keynote speech by stating the requirements for next-generation liquid crystal display (LCD) technologies such as fast response-time, high resolution and slim design. Technological solutions including low-resistance copper bus lines and advanced in-plane switching technology were suggested for achieving high-performance and high-resolution displays. In addition, a variety of technologies of growing interest such as multi-touch interfaces, three-dimensional (3D) displays and viewing-angle control were described as future applications of LCDs.

The second keynote address by Professor Yasuhiro Takaki (Associate Professor, Institute of Symbiotic and Technology, Tokyo University of Agriculture and Technology, Japan) on 3D display techniques, which is an area of immense interest, was highly instructive.

Conventional 3D displays using glass- and glassless 3D technologies have visual fatigue and jerky motion parallax problems. In order to solve these problems, natural 3D display technologies such as super multiview and high-density displays were presented. The most recent research trends in realising a holographic display were also introduced.



The third keynote address by Mr Martin Jackson (Vice-President of Technology, Cambridge Technology Center, Plastic Logic) on plastic electronics was also informative. Traditional paper-based print sales are continuously declining while digital publishing is increasing rapidly. Currently, most E-Ink document readers are fabricated with silicon thin-film transistors (TFTs) that require expensive photolithography processes. The polymer semiconductors are mostly fabricated by a printing or spray process, which is simple and cost-effective. New e-Reader products using such plastic electronics technologies are expected to become commercialised in early 2010, which will open up new market opportunities with the help of the advancements in digital content, ubiquitous smart phones and a publishing industry in search of transformative business models.

In addition to the keynote addresses, there were a large number of interesting oral and poster presentations on a wide range of leading-edge topics of electronic display technologies including organic light emitting displays (OLEDs), projection, active-matrix devices, emissive displays, liquid crystal technology,

flexible displays and 3D displays. Among such diverse topics, here we review the LC-based technologies.

The cholesteric LC (chLC) technologies were of special interest because of their bistability, low power consumption, and compatibility for flexible displays. Researchers from ITRI, Taiwan presented some improvements such as novel coatable chLC materials, new driving waveforms for cost-effectiveness and dual stacking structures using a pixelised vacuum filling technique. Kent Displays reported a flexible electronic skin display through a polymerisation-induced phase separation process on ultrathin plastic substrates.

The fast response of LC material was a dominant topic for higher refresh rate driving of 240 Hz. Fast switching displays showing sub-millisecond response times based on the Kerr effect or the flexoelectro-optic effect of LCs were presented. Professor Jae-Hoon Kim reported the development of the surface-controlled patterned vertical alignment (SC-PVA) mode by UV curing of a mixture of alignment layer and reactive mesogen under an applied voltage. In addition, the most up-to-date results for a polarisation-shielded smectic (PSS) LCD, which can be driven at a frame rate of over 500 Hz, were introduced.

In the LC alignment session, newly developed vertical alignment modes for wide viewing angle properties were presented. The advanced multi-domain vertical alignment (MVA) III technology was reported by AUO. Another interesting VA mode using nanostructures was introduced by Sharp Corporation.

3D display technologies are being increasingly developed. Numerous techniques associated with autostereoscopic and stereoscopic displays were presented and many of them were based on a LC layer with tunable lenticular lens elements. A mobile autostereoscopic display has been developed using a simple backlight system combined with a 3D film. A high refreshing rate of 240 Hz has been achieved using an

active scanning film which has a fast response emissive OLED and a LC shutter glass. Autostereoscopic projection displays based on an integral imaging technique have also attracted much interest for cinema and home-theatre systems.

The flexible display technologies are still in a state that few companies are preparing mass production. In contrast, there were many presentations on flexible display-related components, materials and active-matrix backplanes. New backlight units for small curved mobile displays were presented. By incorporating a lens sheet on a curved backlight unit, both the uniformity and the brightness of the backlight can be improved. Ian French from Prime View International gave a talk on the EPLaR process as a method of producing flexible displays on the basis of the same manufacturing infrastructures as TFT-LCDs. The paper presented by Professor J.A. Rogers on flexible/stretchable electronics for unusual display systems described one of the most valuable active-matrix backplane technologies. Generally, an active matrix backplane is difficult to construct on a plastic substrate because of the need for a low temperature process. By employing various material structures such as nanoribbons and nanomembranes, high-performance stretchable integrated circuits have been successfully demonstrated on fully elastic substrates.

Other important areas represented were mobile displays and novel displays. Different types of mobile LCDs such as polariser-free reflective LCDs, a transmissive-reflective switchable LCD and a twisted-nematic (TN)/low twisted-nematic (LTN) dual domain transmissive LCD were reported. A full-colour scanning fibre pico projector using a miniature lens system has the potential for use as a low-lumen projector for mobile devices. A micro-electromechanical system (MEMS) micro-shutter display was spotlighted because of its high optical transmission and low power consumption.

This year's Display Week has been marked by many interesting OLED papers focusing on commercialisation. Among the LC technologies, the fast response of 240 Hz driving, LED backlights, a blue phase mode and printed oxide TFTs were of more interest, but some areas such as liquid crystal on silicon (LCOS) technologies were rather less attractive than they were at last year's SID. The E-paper displays, touch screen technologies and flexible displays were the hottest topics.



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