

Low Power Daylight Readable Colour Displays

BACKGROUND



“With the rapid growth of tablets, smartphones and other mobile devices, the display performance under high ambient lighting will be increasingly important to consumers - not only for screen visibility, readability, and picture quality, but also for improving the display’s brightness power efficiency, which has a considerable impact on the running time on battery.” - *DisplayMate Technologies*.

Display technology has shown major advancements in the last few years, with excellent results in terms of image quality, flexibility and display thinness. Whatever the current trends in mobile displays, increased screen visibility, good colour reproduction and brightness, and high refresh rates, balanced with low energy consumption, are key aims for manufacturers. One of the innovations which has shown great promise is the use of electrowetting substrates in displays. Electrowetting describes the modification of the wetting properties of a surface using an electric field. The effect can be used in displays to control the shape of beads or droplets of opaque oil, to allow more or less light to pass through to subpixels, each of which is covered by a coloured filter. Electrowetting displays only require a few layers, whereas for example a TFT LCD display has many layers, such as filters, glare reducers and polarizers. An electrowetting display can be backlit, but doesn’t need to be, so it can be viewed with ambient reflective light as with e-ink, or frontlit. It also doesn’t need a polarizing filter, making it much more visible in daylight.

The key aims in electrowetting technology are to use the lowest power to achieve the best result; reduce time lag in the effect (hysteresis), enhance the ability to change droplet shape back and forth (reversibility), and reduce the possibility of additional reactions (electrolysis) caused by large voltages.

THE TECHNOLOGY

A University of Manchester research group has developed a substrate for use in electrowetting displays that gives greatly improved results, and achieves low hysteresis, good reversibility, no electrolysis, and can be operated at a very low voltage of under 1 V. The substrate has been repeat-cycle tested with reliable results.

KEY BENEFITS

For display manufacturers;

- Operation under 1 V
- Rapid cycling
- Good stability and durability
- Simpler set up due to materials used
- Compatibility with existing LCD manufacturing.

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Displays using this technology have the potential to;

- Use less power - be lighter, thinner, with longer battery life
- Be more visible, readable and colourful in ambient light
- Have a high refresh rate to support moving images.

APPLICATIONS

This display technology has application in e-reader displays, tablet and mobile phone displays.

INTELLECTUAL PROPERTY

The University of Manchester has filed a PCT patent application to protect the technology and materials.

PUBLICATIONS

Ultra-low voltage electrowetting using graphite surfaces. DOI: 10.1039/c6sm01565d
Electrowetting on conductors: Anatomy of the phenomenon. DOI: 10.1039/C6FD00252H

OPPORTUNITY

The technology presents an excellent licensing and development opportunity to mobile device and mobile device component manufacturers.

Please see our video about this technology on our YouTube channel <https://youtu.be/35k4dXg604c>

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