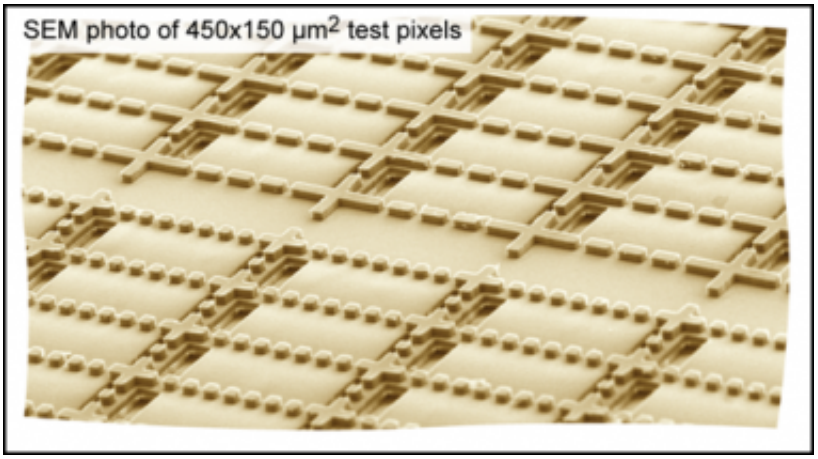
New e-paper display offers low energy/high refresh rate

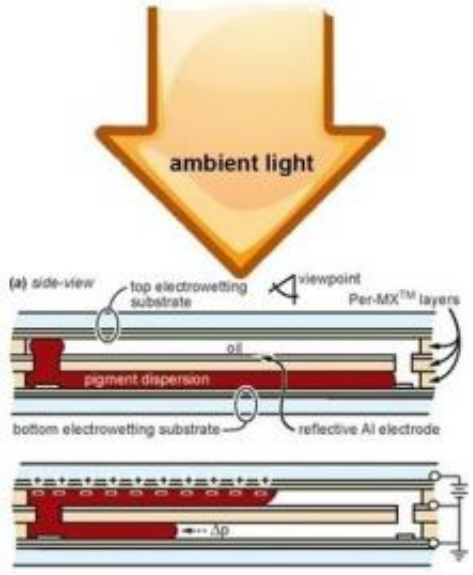
October 11 2010, by Lin Edwards



(PhysOrg.com) -- A new type of display for portable electronic gadgets combines the energy efficiency of low power devices such as e-readers with the high performance of high power use devices such as laptops and smartphones. The new display is called a "zero-power" electrofluidic system and could soon be used in e-readers and other devices.

Internal backlights, like those in smartphones and laptops, are greedy consumers of battery power, while ambient light devices like e-readers use very little power but have slow refresh rates. The new system needs no internal light source and uses reflective light to enable users to see clear, high-speed images with rapid refresh rates, even in bright sunlight.

The new display, or “e-paper” screen, is made from a sandwich of glass, with a film of extremely reflective electrodes in the center, and oil on one side and a pigment dispersion fluid on the other. Light passes through the glass and pigment layer and hits the electrodes, and then is reflected back, displaying the color of the fluid covering each electrode.

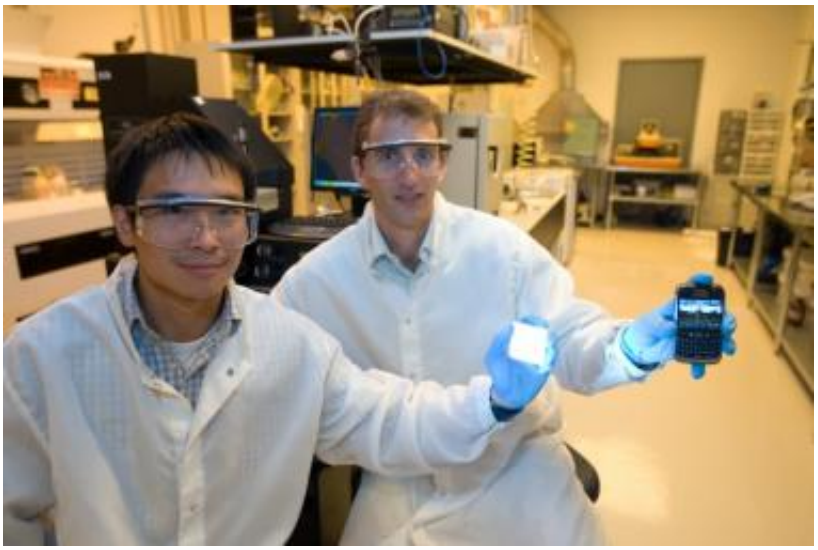


The "zero-power" display diagram. Image credit: Gamma Dynamics

When a small voltage is applied this causes the pigment to flow up through pores in the electrode film, exchanging places with the oil and producing a colored area. When the voltage is removed the pigment flows beneath the electrode layer leaving an unpigmented area of oil. Blank areas with no pigment reflect up to 75 percent of ambient light, which is considerably better than e-ink devices, which reflect around 40 percent, and the image refresh rate is much faster, at about 20 milliseconds, or 50 Hz.

Gamma Dynamics developed the device with the help of Associate

Professor Jason Heikenfeld of the University of Cincinnati and companies Sun Chemical and Dupont. Heikenfeld says the e-paper will produce a good image even in low light conditions such as in a car at night. At the moment the display only works with gray scale, but they are working on a color display.



The first application for the e-paper display is likely to be for supermarket aisle labels and advertising, but it could also soon be used in e-readers and smartphones. Parts for the technology are already available, and manufacture would be low-cost. Limited production of the displays is expected to begin in 2012.

The paper describing the new display was published in *Applied Physics Letters*.

More information:

-- Original paper: S. Yang et al., High reflectivity electrofluidic pixels

with zero-power grayscale operation, *Appl. Phys. Lett.* 97, 143501 (2010); doi:10.1063/1.3494552
-- Breakthrough e-display means electronics with high speed, high readability and low power usage