Enabling new products with flexible displays

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Public interest in plastic, unbreakable and flexible electronics is higher than ever, and the longer-term forecast market potential for flexible electronics is without doubt. However, in the next couple of years what's needed from new technology providers is the ability to offer adaptable and flexible prototyping and manufacturing capabilities to more rapidly converge on the needs of end users.

Recently there have been significant improvements in the state of the art organic thin film transistor (OTFT) technology. The field effect mobility of the best in class materials now well exceeds the performance of amorphous silicon[1] and there is a growing understanding on the mechanisms that influence threshold voltage stability[2]. OTFT technology has two critical advantages to conventional transistors on flexible substrates. First, by removing all the ceramic layers in the transistor stack you can achieve a greater degree of flexibility. Figure 1 shows stable electrical performance of an OTFT device after 10k bends to a radius of curvature 0.5mm. Secondly, OTFT enables manufacturing processes below 100°C. Lower temperature processing is attractive when manufacturing on plastic because enables the use of lower cost substrates (like PET) and reduces the impact of yield detractors like total pitch variation which occurs at higher temperatures.

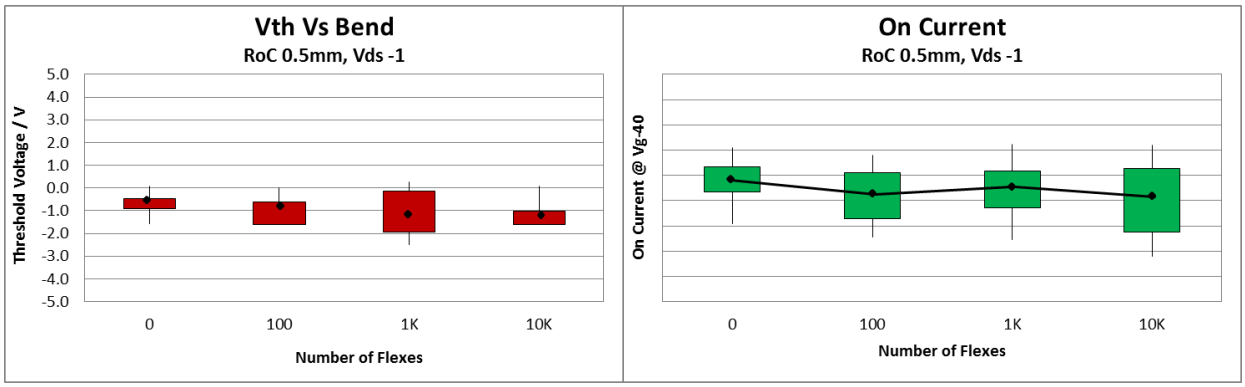

Fig 1. Threshold voltage and on-current stability of OTFT after flexing to 0.5mm bend radius

OTFT technology has already been shown as a promising technology for OLED[3] and EPD[4] displays. Recently FlexEnable has showed that the low temperature OTFT process can also be used to make LCD displays directly on low cost tri-acetyl cellulose (TAC) film. Plastic liquid crystal displays have the potential of making LC cells 10 times thinner, more than 10 times lighter, and cheaper than conventional glass-based displays all whilst delivering differentiating product benefits of being shatterproof and even conformal. The first demonstration seen in figure 2 employs an IPS mode this concept will be equally attractive for many other LC modes and applications.

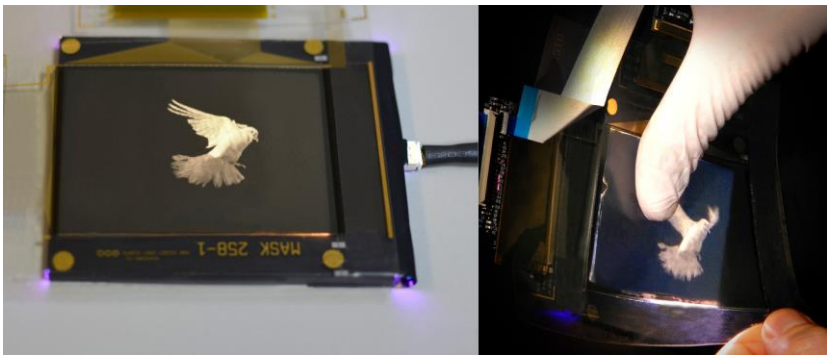

Fig 2. Images of IPS mode plastic LCD display using OTFT

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