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iPhone... Fold?

And Apple's falling behind on the biggest trend for smartphone technology!

Flip-Phones are Back!

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Innovation, Empowerment and Productivity; these are the motivations of leading global technology company, Apple. With the ever evolving world of technological possibilities and consumer demand, Apple remains consistent with their approach and has built a creative innovation culture that stands as an outlier in the market. The current demand for multiple-display phones with powerful capabilities have begun to emerge in the market, and many consumers are waiting for Apple to respond to these trends, wondering "what's next?" for the future of the iPhone.

As Apple innovates seamless experiences through their products, catering to consumer needs and productivity trends. Some of these needs can often be of unrealised value to consumers until they have the product in front of them. The idea of a multiple-display smartphone was insusceptible, until rumours of a foldout smartphone by Samsung were being spread in October 2018, and Samsung delivered with its Galaxy Fold that was released in September 2019.

When considering the consumer criteria of capabilities, the structure that best suits the function would be a 2-3 screen display. On first appearance, the front of the iphone would appear as any other and then open to reveal either a single tablet sized OLED flexible screen or two screens almost seamlessly connected with hinges. It's essential to consider the durability of the product; the structure should naturally accommodate to withstand the thousands of opening and closing of the foldout phone. Outside experts have admitted to not know the full answer to how it works and even Samsung has not found a completely durable screen.The foldout smartphone is at its early stages of ideation for Apple, it has immense potential as the structure would complement the functionality and customisable accessibility to apps with the new iOS14 update.

The technology used to develop the compactibility of a foldout phone is the OLED flexible display. This technology is currently already being used by all flagship smartphones; this is seen

through Apple's use to create the curved edged screens that seamlessly collide with the back material of the iPhone. The transition from LEDs to OLEDs was an obvious and smart decision. It offers better contrast, greater colour range, and much better refresh rates over LEDs - which requires a backlight making them a lot thicker. OLED screens comprise the anode, organic conductive layer, organic emissive layer and the cathode which are pressed together and the organic layers in between release energy in the form of light. Touch sensored flexible screens on flexible devices is not a new idea, and was in an experimentation phase for years before it appeared on your everyday devices. Researchers at the Electronics and Telecommunications Research Institute (ETRI) in Korea, proposed "a transparent and flexible tactile sensor which is designed for multi-touch screen application." In the experiment they used IZO-coated (indium zinc oxide) polycarbonate (PC) film, mounted on a silicon wafer, pressurised together to form flexible touch sensitive screens. This was then successfully applied to a small device with an LCD display and the result was a well fabricated tactile sensor module showing good flexibility which captures multi-touch activity thus, making it a good candidate for touch screens for flexible displays in the future.

One of Apple's current business statements, 'With great power comes great productivity'[4], reflects the potential for a foldout iPhone with strong digital capabilities. Although in marketing, a well-known phenomena emerges; Product Cannibalism[5]. An example of this is, how the audio functions of the iPod merged with the iPhone, creating a more streamlined and convenient experience for consumers and their day to day interests. A multiple-display iPhone with the digital aptitude of an iPad would be an innovative evolution of the Apple product line.

The future of smartphones is now embracing this revolutionary technology of foldout phones and even though the market is still new, Apple is falling behind the consumer demands. By harnessing the full potential of OLED technology and combining it with powerful digital capabilities, Apple will surely empower its users productively and creatively. Thus, revolutionising the way consumers interact with their phones and multitask in their everyday lives.

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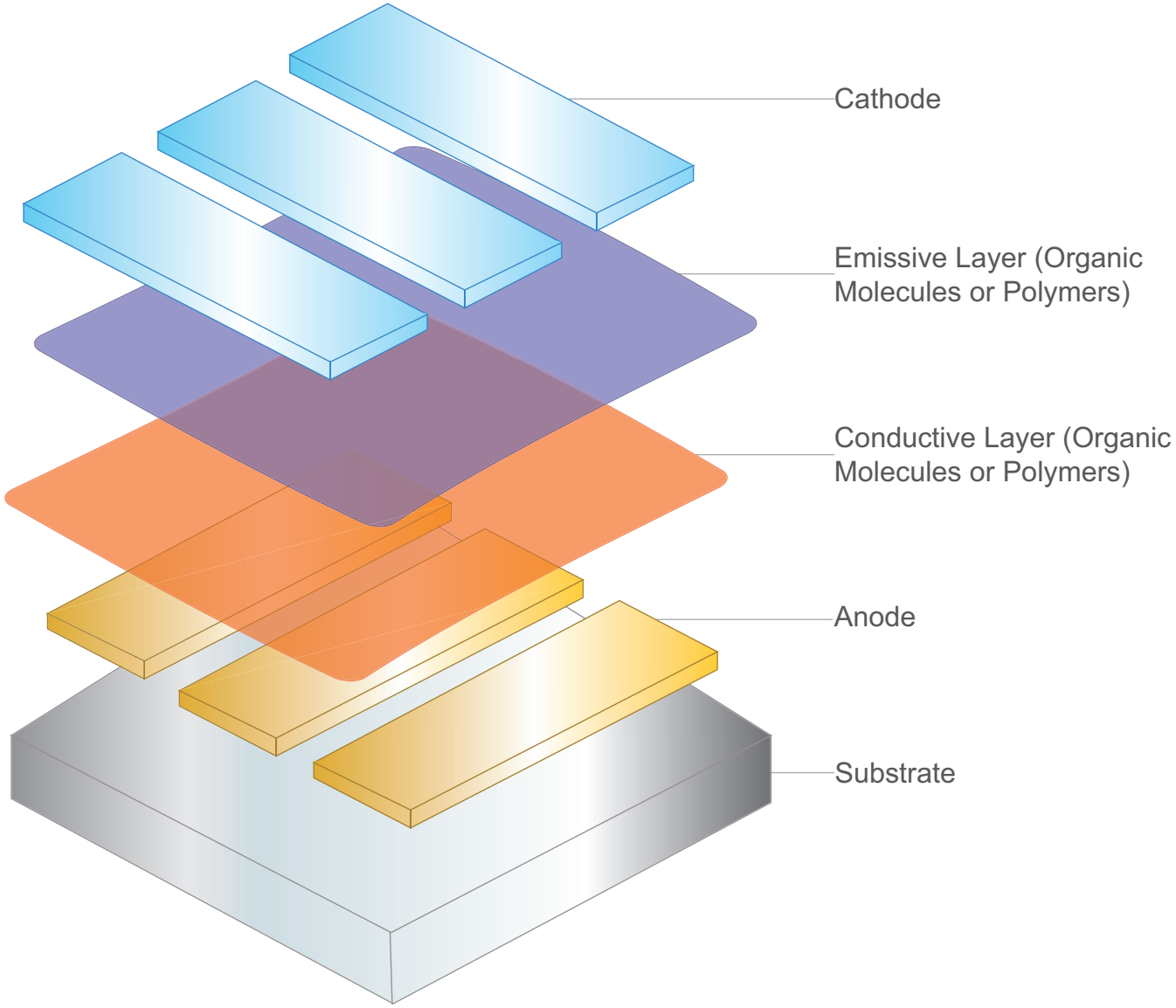
OLED Structure



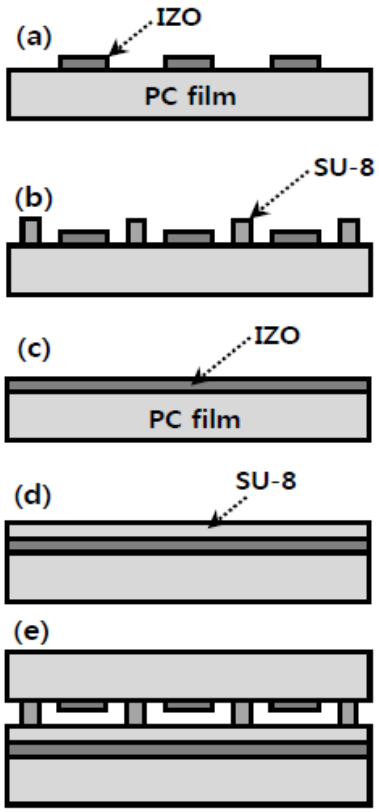


Figure 1: Process flow of a tactile sensor.

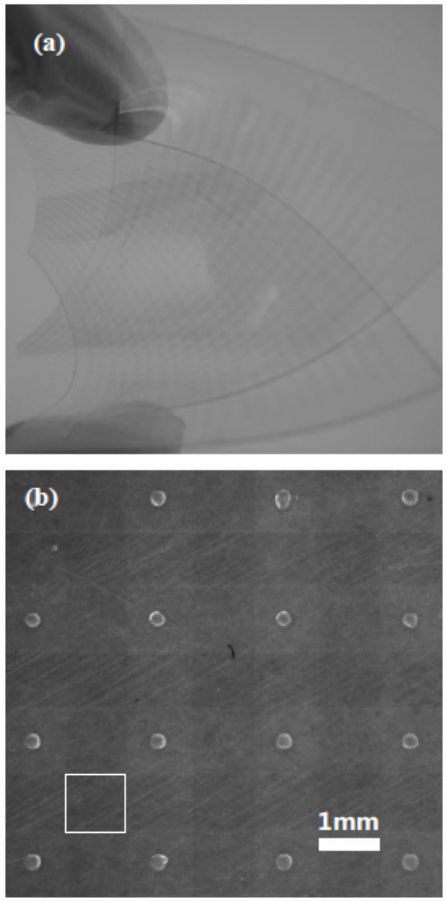


Figure 2: Fabricated tactile sensor. (a) Flexibility and (b) Magnified touch sensor.

Figure 3: Fabricated tactile sensor on LCD display.

Structure of the multi-touch flexible LED screens and the final LED display from the research by the ETRI.