Stretchable, wearable display enabled with Micro-LED and 2D Materials

Jong-Hyun Ahn [1]

[1]Yonsei University, Korea, Republic of

Micro-LED is more robust, longer-lived andcompatible with conventional fabrication processes. Recentlythe micro-LED based display has attracted considerable attention because ofvarious applications such as smart watches, smartphone and large size display. However, the display which has beendemonstrated was passive matrix (PM) type, which sequentially addresses each pixel in arow–column scheme with a high rastering frequency, requires high powerconsumption. These limitations restrict the applicationrange of PM displays.

Toaddress the issue, we integrated astretchable, active matrix (AM)-type inorganicLED display driven by thin film transistors(TFTs) fabricated from single crystal Si, which would achieve large-size displays with rapid response timeand low power consumption. The micro-LEDs and Si-TFTs were moved fromsource wafers to a rubber substrate by triple successive transfers with a softroller stamp and high overlay alignment. To improve the electro-mechanicalstretchability, the LEDs and TFTs were interconnected with each other using serpentine-shapedmetallic thin films.[1]

In addition, we present the synthesis of high quality anduniform, wafer scale MoS_2 and modified switching device architecturefor efficiently exploiting the high-k dielectric Al_2O_3layer, which, when integrated in anactive matrix can drive the ultrathin OLED display even in dynamic foldingstates.[2]

References

[1] M. Choi et al., Advanced Functional Materials 27, 1606005(2017)

[2] M. Choi et al., Science Advances 4:eaas8721 (2018)