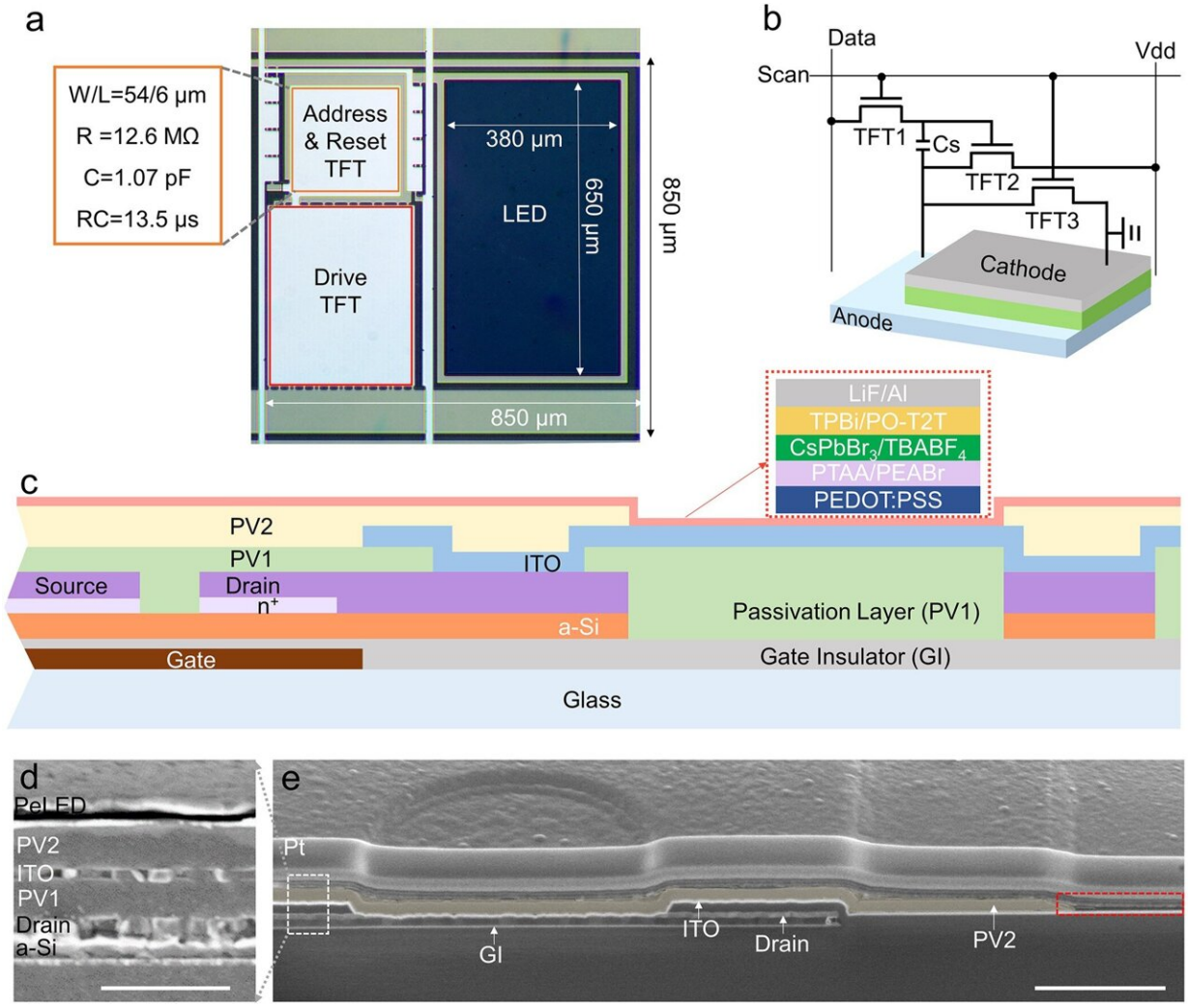
Researchers demonstrate second-generation digital display with perovskite light-emitting diodes

July 2 2024, by Bob Yirka



Structure of AM PeLED. a, Micrograph of one single pixel in the TFT backplane showing the layout of TFT and LED area. b, The schematic diagram

shows the control of LED by the 3T1C circuit. c, Structure diagram of the drive TFT and LED. d, e Cross-sectional scanning electron microscope (SEM) images of the drive TFT and ITO. Credit: *Nature Electronics* (2024). DOI: 10.1038/s41928-024-01181-5

A team of microelectronic engineers affiliated with several institutions in China, working with a colleague from Sweden, has demonstrated a second-generation digital display screen that uses perovskite light-emitting diodes instead of standard LED technology.

In their study, published in the journal *Nature Electronics*, the group made improvements to the device and demonstrated its sensing capability.

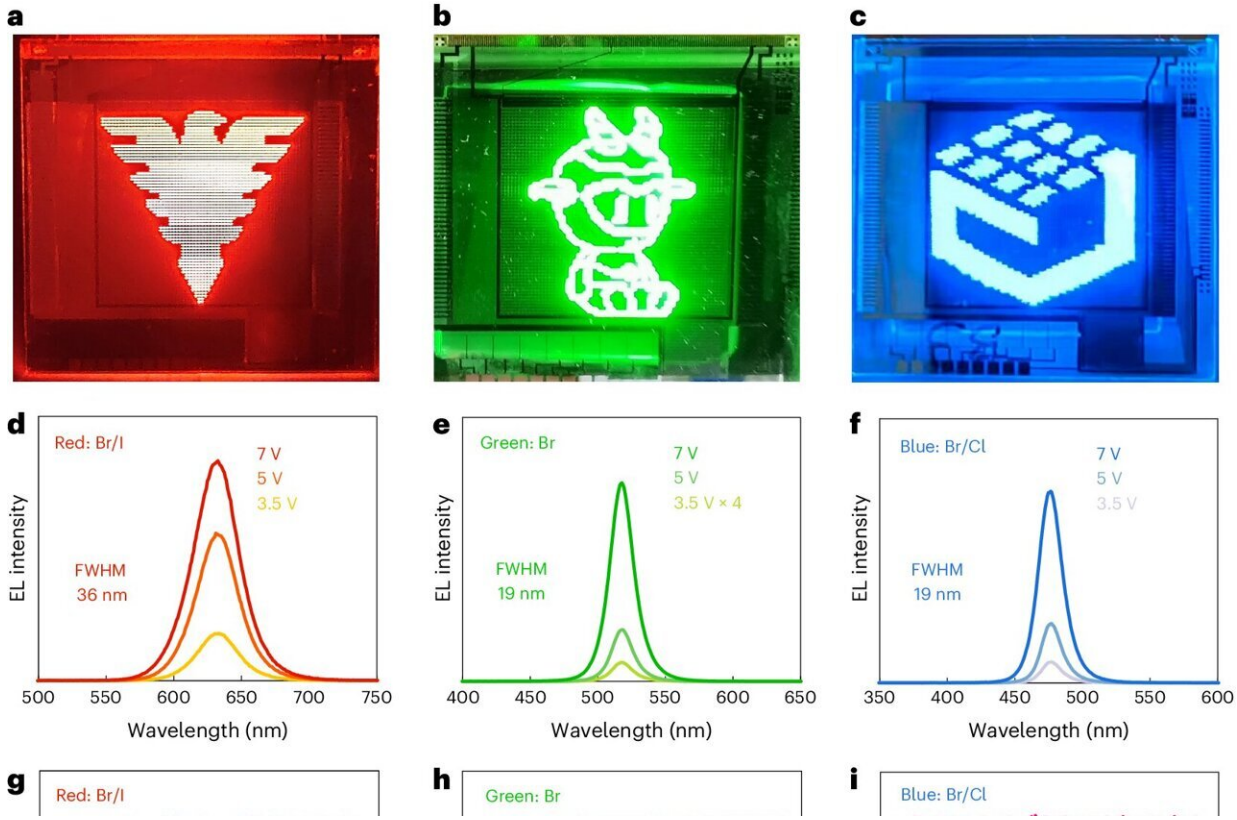
In April, a research team with some of the same members demonstrated a digital display screen using LEDs made out of perovskite instead of semiconductor compounds such as gallium, arsenide or indium gallium nitride. They also showed that such screens could be used as sensing devices.

For this new study, the researchers also built a digital display device using perovskite light-emitting diode (PeLED) technology—this one with double the pixel resolution.

Current materials used to make LEDs have attributes including a high degree of acuity and sharpness. But the technology had limitations, such as an inability to serve as a sensor—other components have been used to fill the gap.

To overcome that limitation, researchers have been looking at perovskite, because in addition to emitting light, it can also absorb it,

allowing it to be used as a sensing device. If a phone had PeLEDs, the screen would be able to sense touch, a fingerprint or even ambient light, mitigating the need for other components.



One-inch AM PeLEDs with a resolution of 90 PPI (pixel size 270 μm × 270 μm). a–c, Digital photographs of the red (a), green (b) and blue (c) emissive AM PeLEDs showing cartoon pictures. d–f, EL spectra of the red (d), green (e) and blue (f) emissive AM PeLEDs at various Vdd driving voltages, displaying a single peak with narrow full-width at half-maximum (FWHM). g–i, Transient EL intensities of red (g), green (h) and blue (i) emissive AM PeLEDs under various pulse durations. Credit: *Nature Electronics* (2024). DOI: 10.1038/s41928-024-01181-5

The new screen demonstrated by the research team had a 90 ppi density—a far cry from the densities of current smartphone screens, but a step toward equivalence. It also demonstrated a host of sensing abilities. The researchers believe such displays will also have much longer lifecycles and use less energy.

On the downside, researchers have had to contend with stability—exposing PeLEDs to oxygen or moisture leads to degradation, an issue that will have to be solved before such technology could be used in commercial devices.

More information: Yun Gao et al, Microsecond-response perovskite light-emitting diodes for active-matrix displays, *Nature Electronics* (2024). DOI: 10.1038/s41928-024-01181-5