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Heterogeneously integrated micro LEDs for displays and beyond

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As self-emitting devices without the need of back light units, Micro LEDs are suitable for many applications such as novel displays. Micro LED displays have the potential to enhance the capabilities of LCDs and OLED displays with its excellent performance in many different aspects, particularly high LUE, simplicity of optical modules without back light unit, long life time and excellent visibility under bright day light. Our group has been working on micro-LED technologies for more than a decade. We have reported the design and fabrication of high pixel per inch (PPI) micro-LED displays with red, green, blue and UV colors by integrating monolithic LED micro arrays and active matrix substrates using Flip Chip technology. A CMOS active matrix driving scheme was designed to provide sufficient drive capability and individual controllability of each LED pixel. The micro LED displays had 400×240 pixels on a single chip with PPI upto 1700. The emission wavelengths were 630 nm, 535 nm, 445 nm and 380 nm respectively. The red, green and blue micro LED displays can be used to form a novel full color direct view display. The micro LED displays could be used for modulated visible light communication systems or for data modulated photo pumped organic semiconductor devices.

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