the electrode spacing increased to be 3–4 μm caused the need to use photoalignment called UV2A instead of conventional rubbing process as reported by Miyachi et al. [101] and one-drop-sealing was employed for shortening of the production time and other necessary equipment such as large-scale UV exposure and handling robots have been largely developed and utilised along with highly developed peripheral materials such as alignment films.

This decade recorded the so-called three 100: 100 BUSD, 100-in., and 100 times large area of mother glass from the first generation and further LCD replaced CRTs for PC monitors and TVs.

1.3.7 2010s


High-resolution TV broadcasting started with 4K2K TV in 2012 and 8K4K LCD TV is on the market by Sharp and broadcasting of 8K4K starts in 2015 with high frame rate LCD in 2015 [102]; OLED displays have been on the market for smartphone and TV usages since 2016 as shown in Figure 1.1. Current advancement of flat panel TV is largely supported by the utilisation of oxide semiconductor TFT with 10 times high electron mobility than that of a-Si on oxide semiconductor TFT that is useful for 8K4k LCD TV. Hosono at Tokyo Institute of Technology developed oxide semiconductors (OSs) of not only n-type amorphous type but also p-type one [103]. Yamazai at Semiconductor Laboratory also developed crystalline OS called CAAC-IGZO [104]

Other trends were the utilisation of quantum dot (QD) for LCD TV