

Development of the TFT backplane for Flexible Display by Advanced Printing Techniques

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Flexible display is one of the most active technology areas in the display industry. In order to spread the flexible display widely, it has been strongly required to develop the manufacturing technologies for inventing mass production phase. In order to establish a manufacturing line with high productivity, print technology is one of the most promising candidate technologies. We have tried to develop the all-print process for flexible device manufacturing, and “sheet to sheet” manufacturing line to prove the possibility and reality of production technologies. Recently, we have constructed the fully-automated and continuously operated manufacturing line in order to produce the all-printed flexible TFT backplane. In our developed automated and continuously operated manufacturing line, main clean robot carried film substrates in the clean tunnel connected various printers and heat process funnels. We operated the newly developed offset printer, inkjet printer, screen printer, gravure printer and die-coater for making each functional layer. Respective newly developed printers are arranged to operate at an appropriate timing to get enough high performance for the flexible display specification. Specialized ink materials, for example Ag nano particle ink for gate electrode and source/drain electrode, highly purified polymer ink for gate insulator, and organic semiconductor ink for TFT active layer have been developed. Furthermore, we have developed the process technologies which were suitable to continuous manufacturing of printing and curing fine pattern without vacuum process and photolithography process. The maximum process temperature was less than 180 degree C. Typical film size of TFT backplane was 300mm x 400mm x 50um. In this manufacturing line, we can use several flexible film substrates such as PEN, PC, and PI film as needed. Prepared flexible TFT backplanes were applied to prepare a flexible display and flexible sensors.

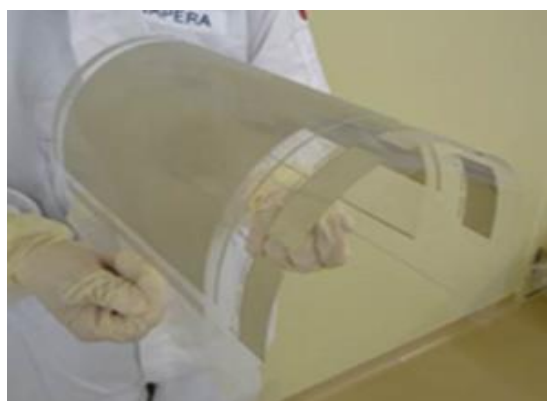


Fig. 1. Prepared flexible TFT backplane by the manufacturing line

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