Fabrication of Color Filter Array on Transparent Polyimide Film using Laser Free Release Process

Hyewon Jung, Changho Cho and Kyungjun Kim*
Advanced Materials R&D, LG Chem.,
188, Moonji-ro, Yuseong-gu, Daejeon 305-738, Korea
Tel.:82-42-866-2509, E-mail: kjkima@lgchem.com

Appearance of AM-OLED display have prompted us to realize flexible display. Especially, White OLED (WOLED) is the most promising technology in the large-sized display including flexible display. In the white emission type OLED display with bottom emitting structure or top emitting structure, color filter array is exclusively used. In case of bottom emitting structure, color filter array is directly photolithographed on the TFT layers as a mature technology. The color filter array of top emiting structure has been attempted by a direct printing process or color filter film lamination on the backplane. Although the lamination process has attracted considerable interest in top emitting structured WOLED as cutting-edge technology, it has several shortcomings like bubbles during lamination process and contamination by volatile compounds from color resists caused by low temperture curing would affect seriously on the quality of the display. Therefore, low temperature curable color resists and carefully controlled lamination process have been developed. Since IBM announced the coating plastic process it has been the most common process to make flexible OLED display. The coating plastic process uses carrier glass as a coating substrate to form flexible film from polymer varnish. After finishing the AM-OLED process, laser release process is used for the separation of OLED layered films from carrier glasses. However, the laser release process is one of the hurdles for lowering the display manufacturing cost becuase of high equipment cost and low throughput.

In this paper, we show the fabrication of color filter array on the transparent polyimide film using the coating plastic process and release the color filter patterned film without laser. Polyimides were synthesized with various molecular composition. Especially, polyimides using fluorinated monomers showed high transparency and high thermal durability. The fabrication of polyimide film was performed on the carrier glass. Each resists were patterned on the polyimide film and postbaked at various temperature. The shapes and stability of the color patterns are investigated according to post bake temperature. We also studied that the interface adhesion was controlled by molecular sutrcure and imidization temperature of polyimide and our novel release technique was employed to separate the color filter array film from carrier glass without laser ablation. Figure 1. shows patterned color filter array on the poyimide film using 370 x 470 carrier glass. Consequently, our results suggest improved manufacturing process for the fabrication of color filter array in WOLED

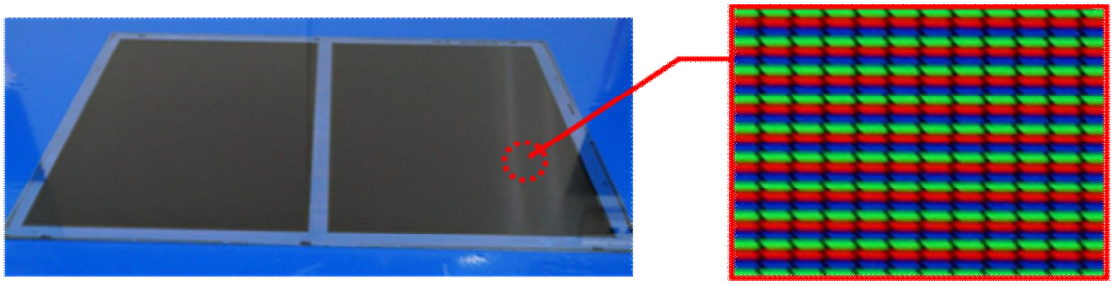

Fig. 1. Color Filter array fabricated on 370x470 polyimide coated glass

Acknowledgment

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References

1. M. Noda, *SID 2012 DIGEST,* p. 998 (2012).

2. F. E. Doany, C.Narayan, *IBM Journal of Research and Development, ID'05 Technical Digest*, vol. 41, p. 151 (1997).