Improvement of Pattern Quality and Performance of Inkjet-Printed OLED

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Simple and low-cost process for micro-scale patterning is attractive for a development of electronic devices with large-area organic light emitting diodes (OLEDs). In this presentation, we described the patterning technique for light-emitting layer of OLED by direct printing using the emitter inks with co-solvent mixture, since such a homogeneous mixture of solvent with different boiling point and surface tension is advantageous for good film uniformity due to the reduction of coffee ring effect at the drying process [1]. During the inkjet process, we have controlled drop injection density, aiming for better drop-to-drop spacing and reduction of line-edge roughness (see Fig 1a and 1b). Drop mixing during the jetting condition as well as drying condition may be further control parameter for improved OLED pixel uniformity of inkjet-printed devices [2, 3]. Printed pattern of organic light emitter, representatively composed of co-host mixture [poly(9-vinylcarbazol); PVK and 2,6-bis(3-)9H-carbazol-9-yl)phenyl)pyridine; 26DCZppy hosts, doped with fac-tris (2-phenylpyridine)iridium; Ir(ppy)$_3$ dopant], shows that employment of co-solvent resulted in a significant reduction of line edge roughness as well as coffee-ring effect (Fig 1c). We have also compared the processes of inkjet printing with electric field-aided nozzle-jetting, which accompanies the formation of ultrafine meniscus at flow nozzle by the application of electric field, focusing the improved pattern uniformity of light-emitting pixels of OLED with higher resolution.

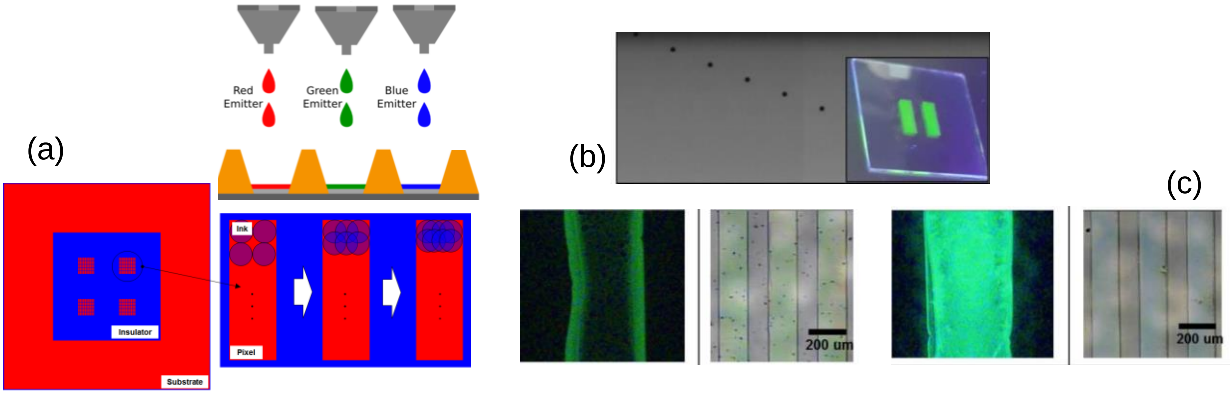

Fig. 1. (a) Schematics of inkjet-printed OLED pixel with optimized drop injection recipe
(b) Uniform jet flight forming line-stripe light emitting patterns
(c) Comparison of single solvent (left) and co-solvent based jetting pattern with green emitter

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References

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