Printing of organic light emitting diodes on textile

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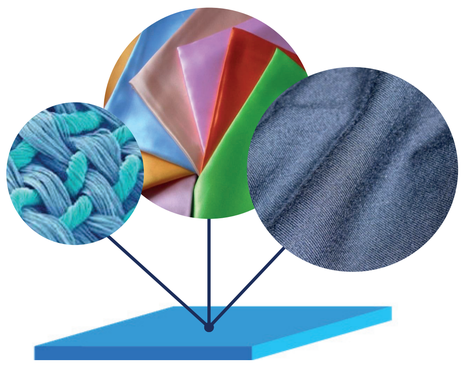
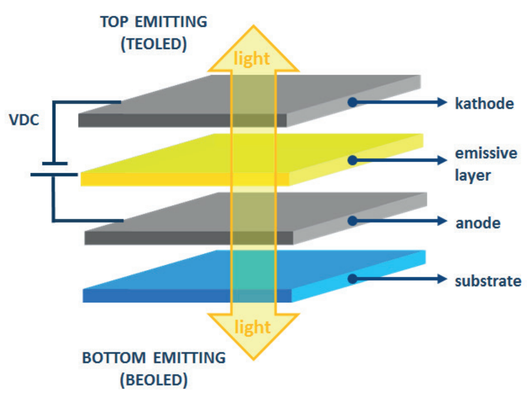
Introduction

Textile substrate



Top emitting organic light emitting diode[1] [2]



Applications

- ▶ Protective or safety clothing
- ▶ Indoor and outdoor design
- ▶ Advertisement
- ▶ Healthcare applications

Experimental

OLED stack

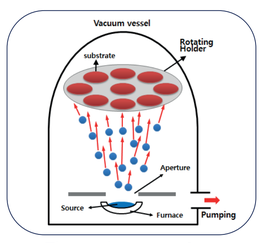
Material

Encapsulation

Ca / Ag top contact

- ▶ 12 nm Ca / 17 nm Ag
- ▶ Transparent contact
- ▶ Thermal evaporation (vacuum deposition technique)

Techniques

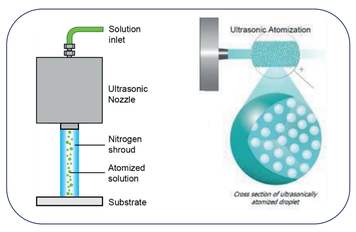


Thermal evaporation

Thermal evaporator

Super Yellow

- ▶ 80 nm
- ▶ Organic emission layer
- ▶ Spin coating
- ▶ Ultrasonic spray coating

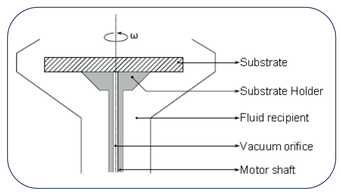


Ultrasonic spray coating

Sono-Tek spray coater

PEDOT PSS

- ▶ 35 nm
- ▶ Hole Injection Layer
- ▶ Spin coating

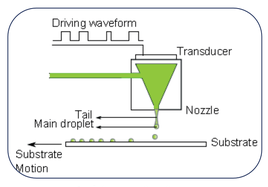


Spin coating

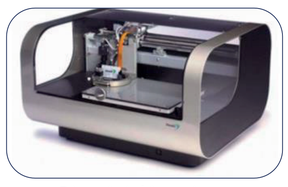
Spin coater

Ag bottom contact

- ▶ 200 nm
- ▶ Thermal evaporation
- ▶ Ink jet printing



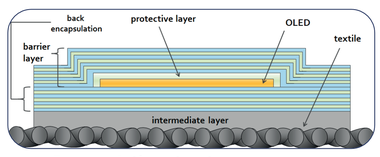
Inkjet printing



Dimatix inkjet printer

Encapsulation

- ▶ To avoid contact with water vapor and oxygen
- ▶ Plasma techniques

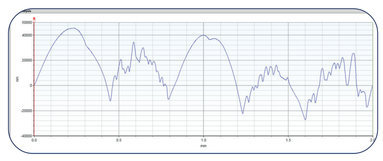


Encapsulation structure

Plasma reactor ECR

Covering layer

- ▶ Roughness textile to high for nano-layers OLED
- ▶ PU, acrylate, PMMA, …



Dektak surface profile measurement on polyester

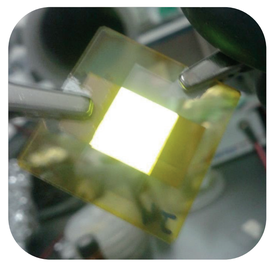
Textile + polyurethane

Textile + acrylate

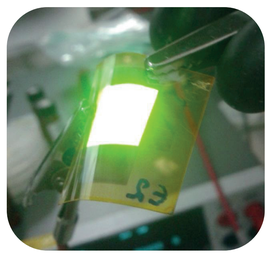
Textile substrate

Results

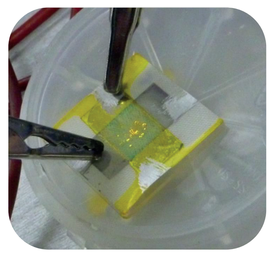
TEOLED on glass



TEOLED on PET



TEOLED on textile



Conclusion

- Further development of flexible and encapsulated OLEDs on PET
- Research best suitable covering and smoothing layer on textile
- Development of flexible and encapsulated OLEDs on textile

References

[1] D.-Y. Chung, J. Huang, D.D.C. Bradley, A.J. Campbell, *Organic Electronics* **11(6)**, 1088–1095, (2010)
[2] J.-S Park, H. Chae, , H. K. Chung & S. I. Lee, *Semiconductor Science and Technology* **26(3)**, (2011)

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