

OLED manufacturing for large area lighting applications

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OUTLINE

- **INTRODUCTION**
- **EXPERIMENTAL**
- **RESULTS & DISCUSSION**
- **CONCLUSIONS**
- **REFERENCES**

Aims of this article

OLEDs

- lighting applications
- Small size \rightarrow Large size
- Layer thickness homogeneity



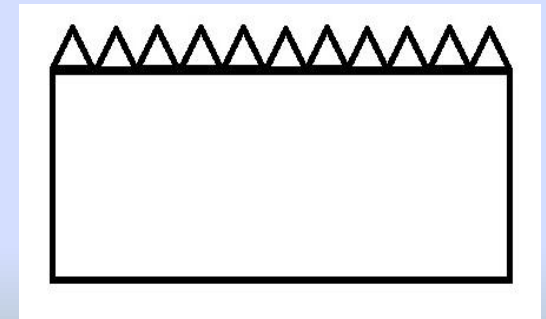
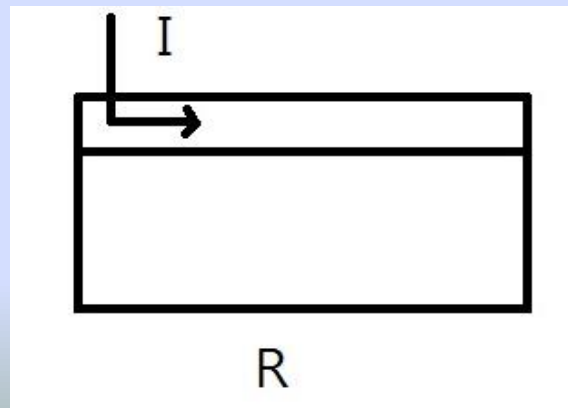
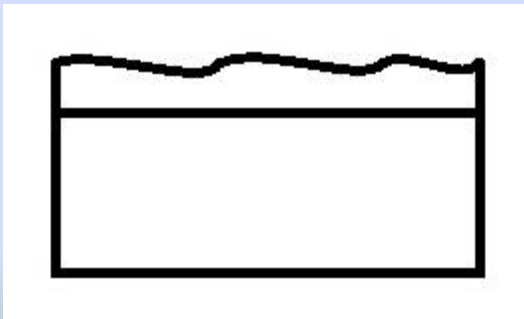
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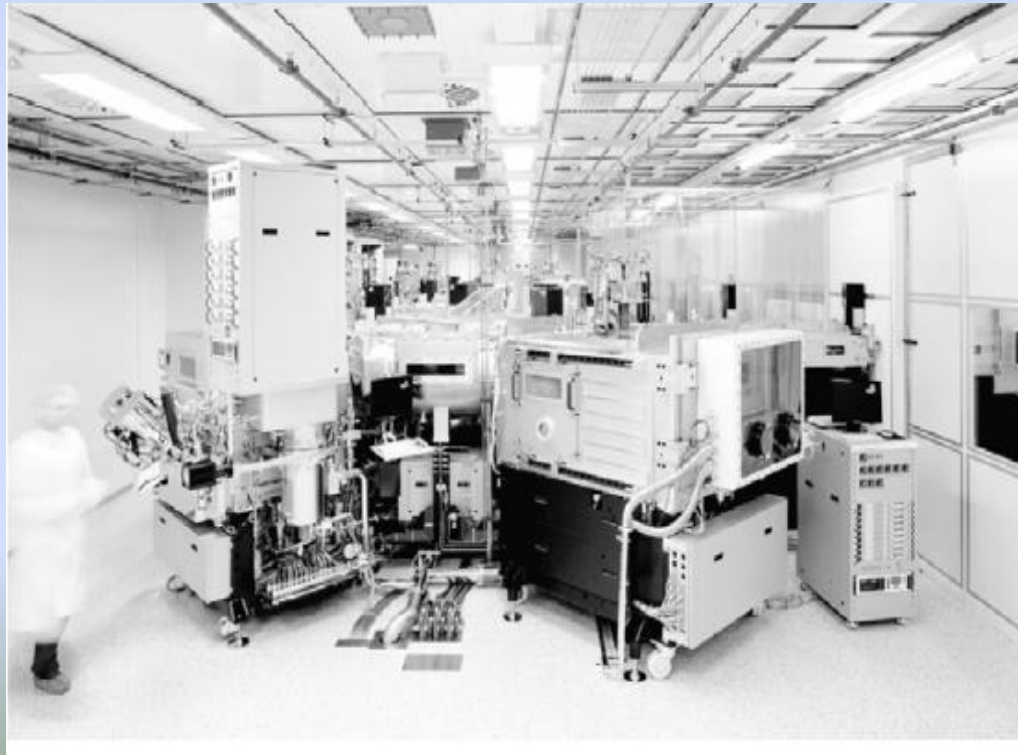
- expected features

1. Layer thickness homogeneity $< \pm 5\%$
2. low sheet resistance of $1-50 \Omega/\text{sq}$
3. low roughness $< 1\text{nm}$



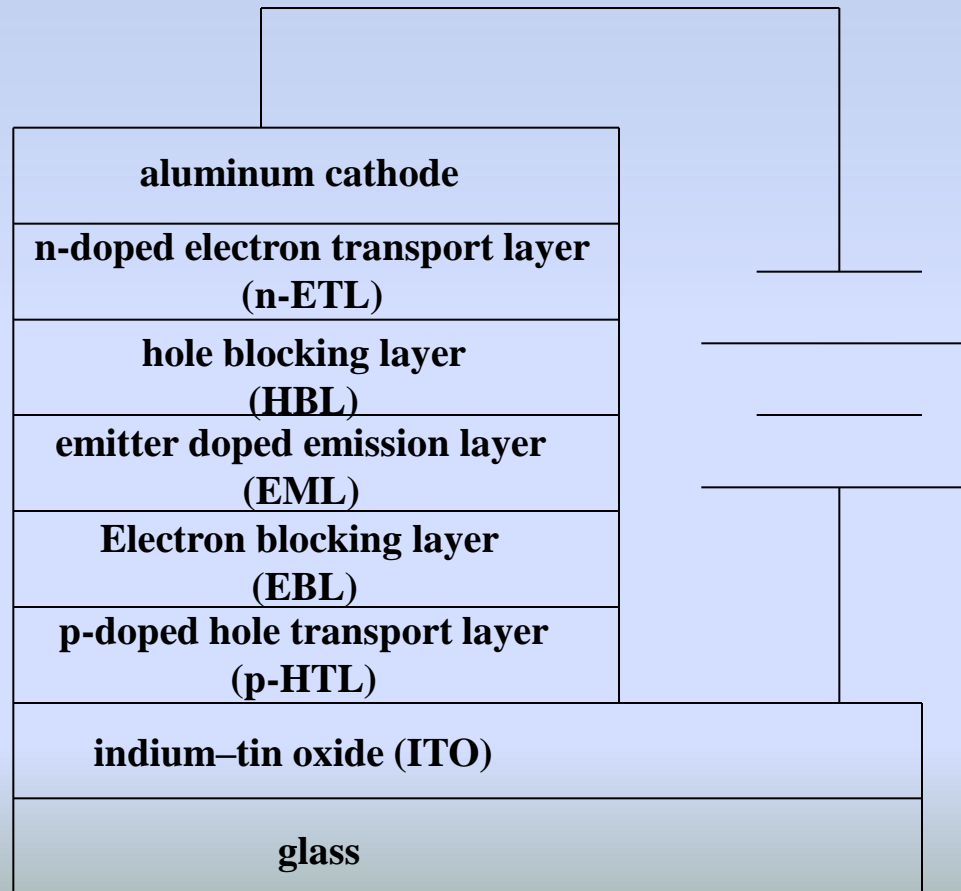
OLED deposition tool

- Substrate size=370 ×470mm²
- system : pre-treatment 、 Organic layer deposition
Metal deposition 、 Encapsulation



EXPERIMENTAL

OLED device structure



RESULTS & DISCUSSIONS

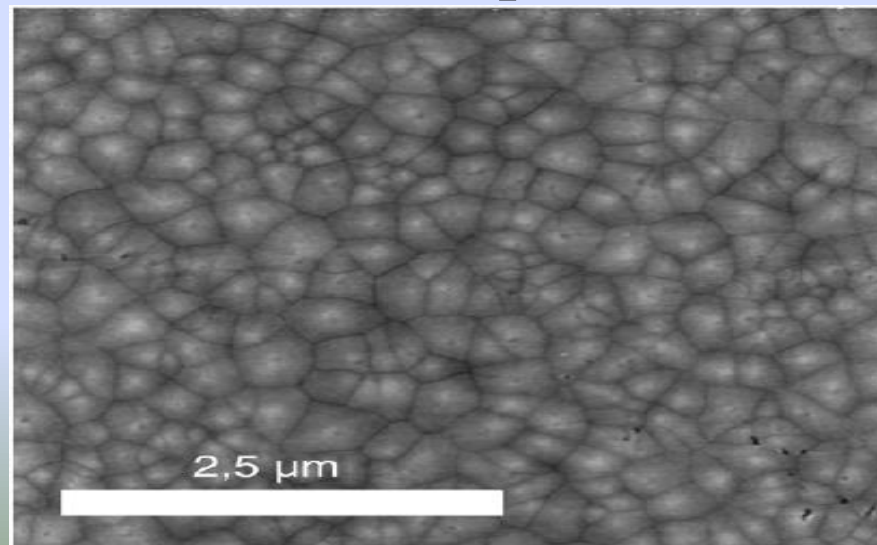
ITO propeirtion

- low roughness

$$R_q \text{ (RMS)} = 0.6\text{nm} \quad R_{\text{MAX}} = 12\text{nm}$$

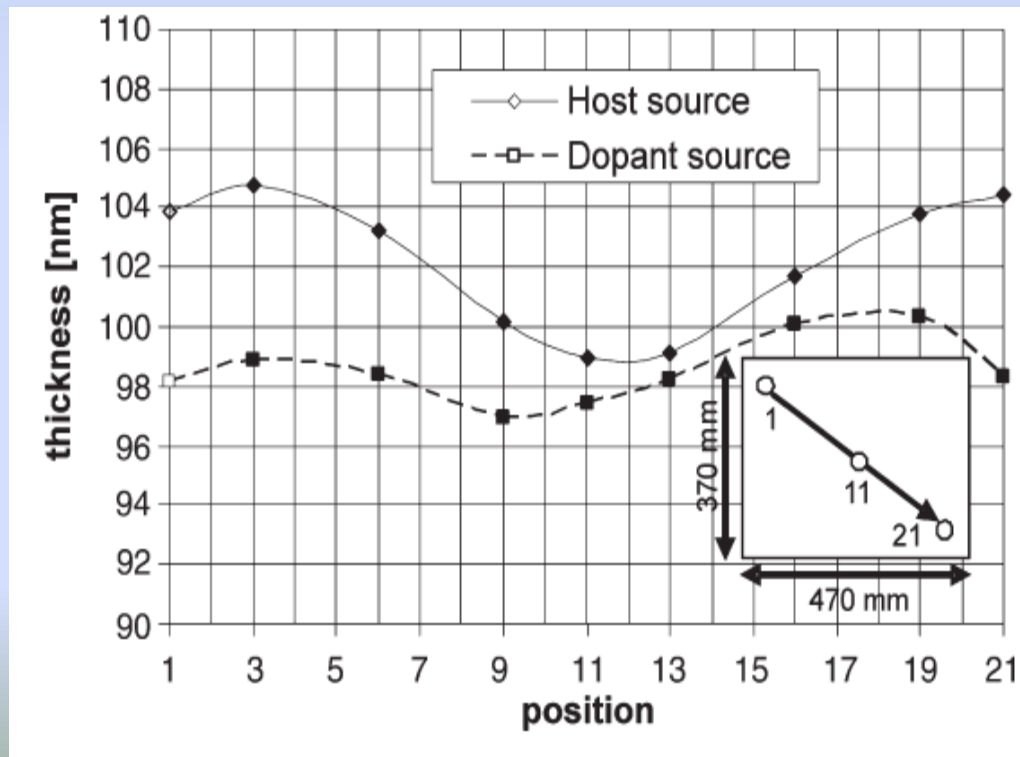
Electrical property

- sheet resistance = $\sim 35\Omega/\text{sq.}$



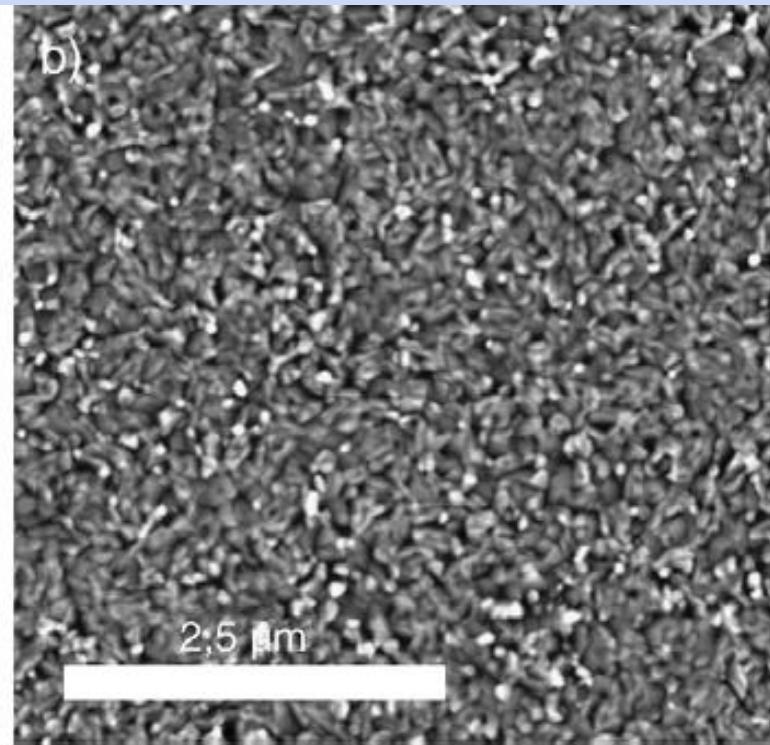
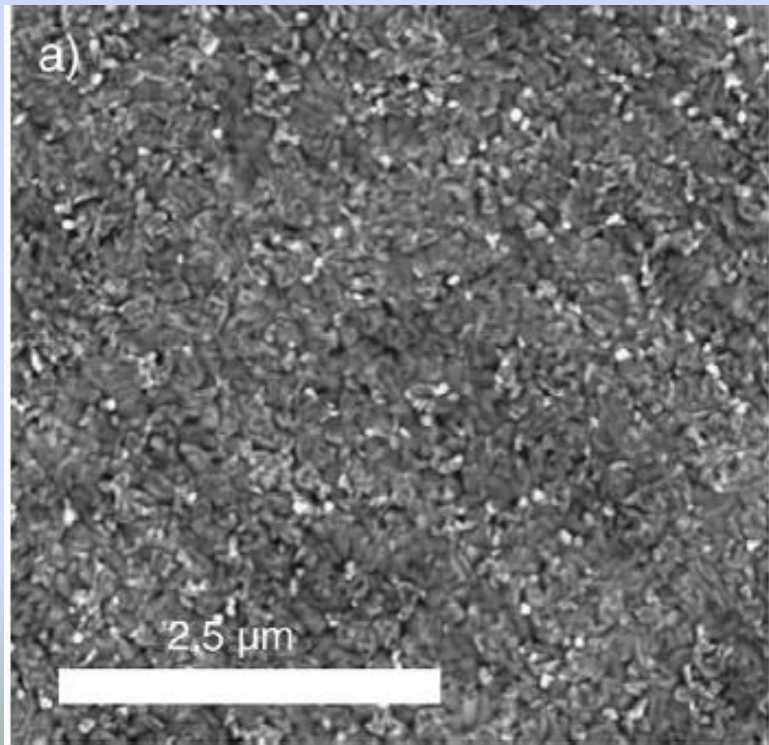
Deposition homogeneity

- deposition rates : host homogeneity = 1.7 % at 2.0 Å/s
dopant homogeneity = 2.9% at 0.5 Å/s



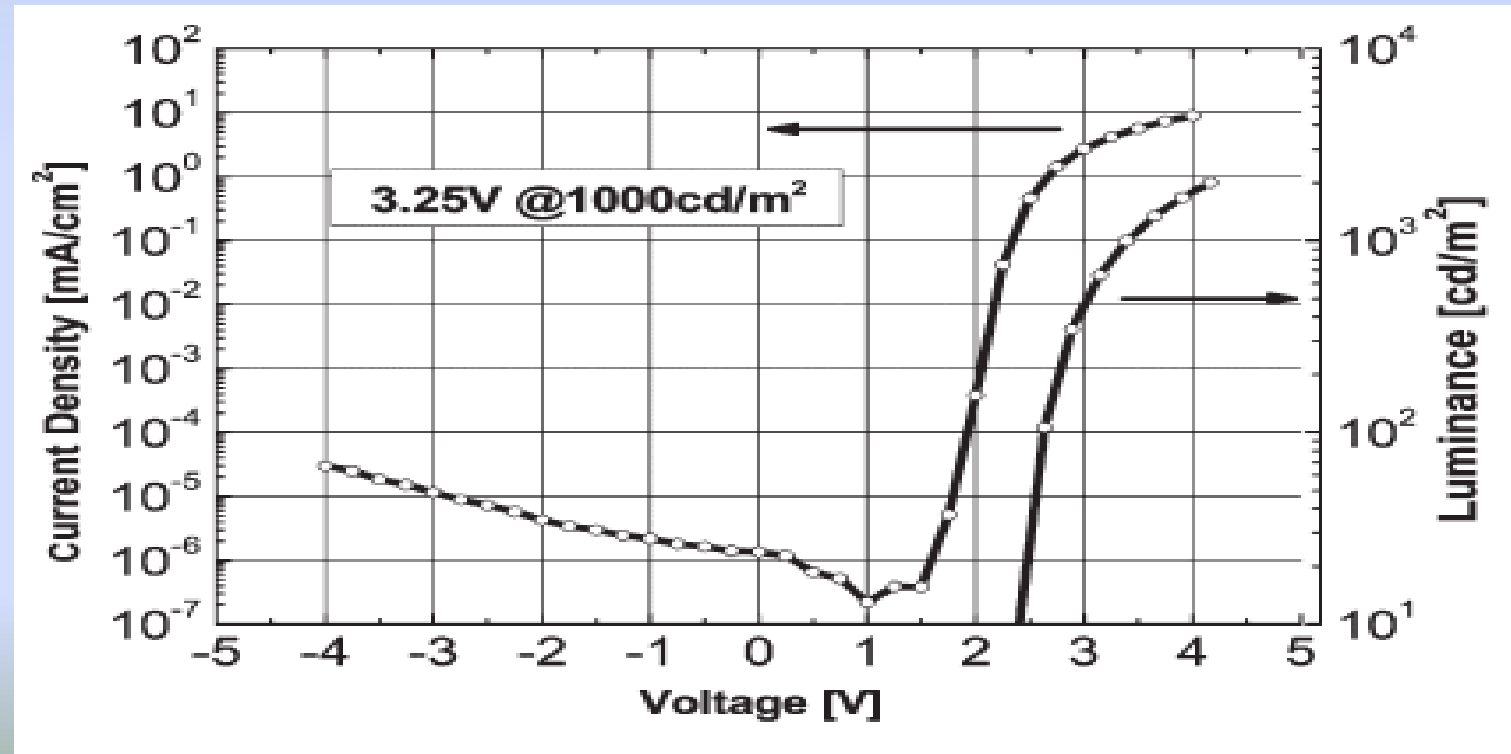
A cathode deposition

Deposition rate ($\text{\AA}/\text{s}$)	R_q (RMS) (nm)	R_{MAX}
12.5	1.5	20.6
25.0	2.0	19.5

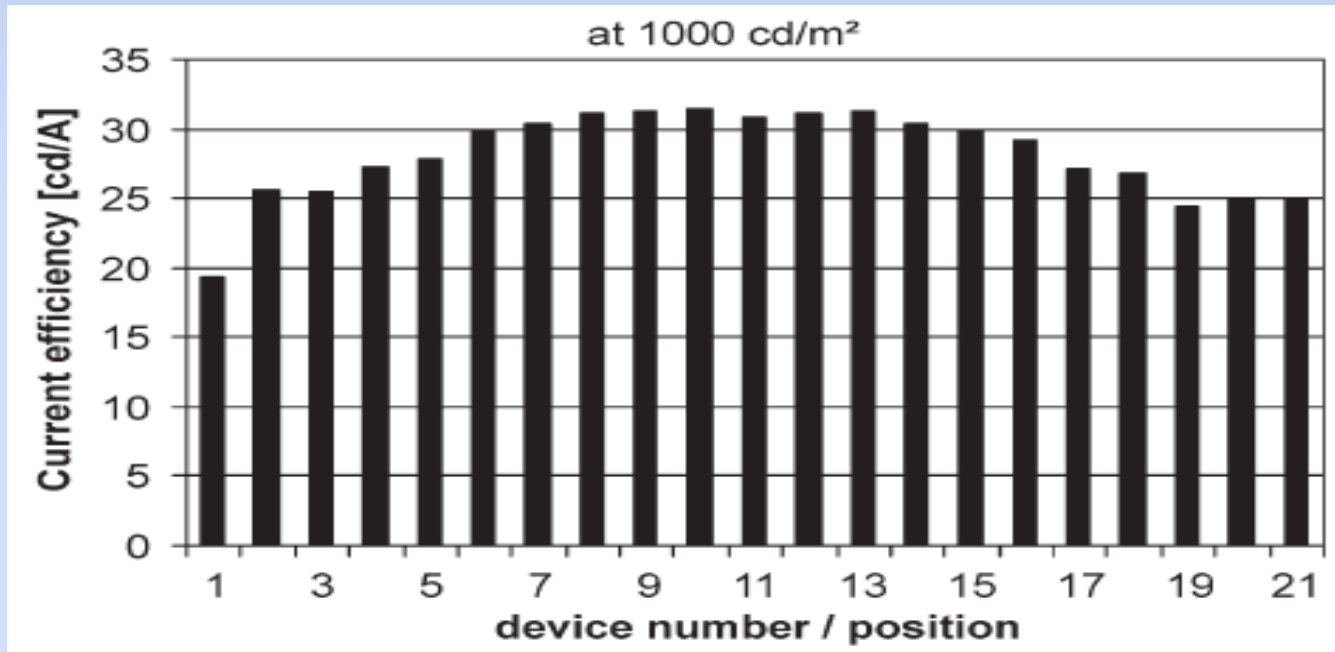


I – L – V characteristic of OLED

Voltage (V)	Luminance (cd/m ²)
2.5	100
3.25	1000



C – P characteristic of OLED



CONCLUSIONS

With an OLED deposition tool , OLEDs with good performance have been achieved.

- Homogeneity of Alq3 (below 1.7% at 2.0Å /s and 2.9% at 0.5Å /s) is better than the predicted 5% .
- low roughness of ITO (Ra = 1nm) .
- sheet resistance = $\sim 35\Omega / \text{sq}$.
- good efficiency data between 19 \sim 31 cd/A

REFERENCES

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THANKS FOR YOUR ATTENTION