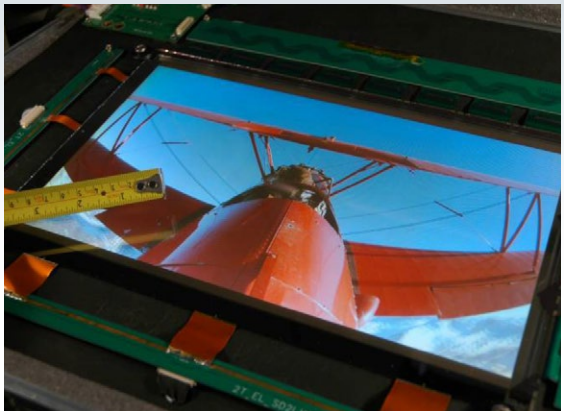
C|D|T Cambridge Display Technology

Barrier | **Displays** | OTFT | Insulator | Optical sensors | Lighting | Energy systems | Flex displays | OPV | Biosensors | Development partner

OLED Display Technology

Solution Processed OLED Technology

- Our core technology and expertise is in the development of high performance solution processed polymer OLED materials.
- Materials are compatible with large area patterning techniques such as inkjet printing.
- P-OLED materials can be inkjet printed reproducibly, producing RGB colours and the high performance required for colour displays.



P-OLED Device Test Cell Performance Summary

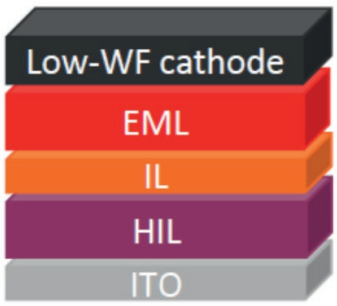
Spin/BE @1000 cd/m²	RED	RED	GREEN	GREEN	BLUE	BLUE
Efficiency [cd/A]	24	28	92	112	10	9.3
C.I.E. x,y	0.66, 0.34	0.66, 0.34	0.33, 0.62	0.33, 0.62	0.14, 0.12	0.14, 0.11
T95 lifetime @ 1000 cd/m² *	5800	Ongoing	17000	Ongoing	700	400

Device structure: ITO (45nm) / HIL (30-65nm) / Interlayer (20nm) / LEP (60-90nm) / Low WF cathode

- Hole injection, interlayer and emitter are all processed from solution.
- RGB use common hole injection, interlayer and cathode.
- Devices fabricated by spin coating processes.

*Lifetime estimated from luminance acceleration test.

*No electrical ageing applied before lifetime test.



Non-cavity device

EML = emissive layer (R, G, B)

IL = interlayer

HIL = hole injection layer

Key Areas of our Expertise in P-OLED Development:

- CDT and Sumitomo Chemical have extensive technical expertise in materials chemistry and device physics to realise high performance materials for high end display and lighting applications.
- Our expertise covers a fundamental knowledge of materials and devices through to complex understanding of the interplay between ink formulation, print process science and fabrication engineering for realising high performance printed displays.

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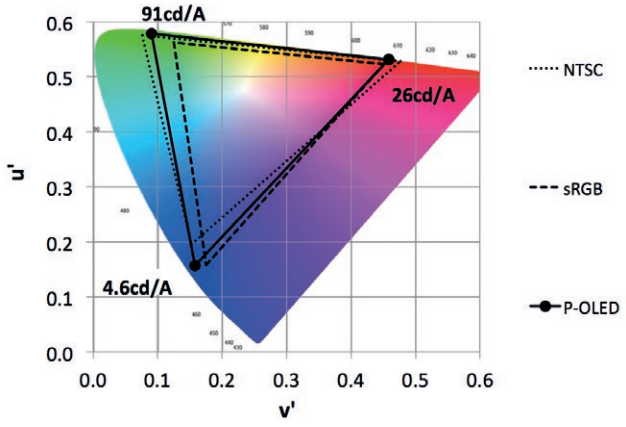
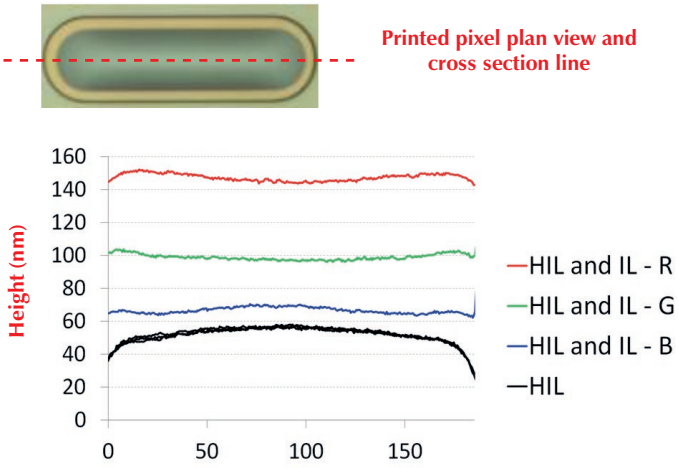
Materials, Formulation and Process Development:

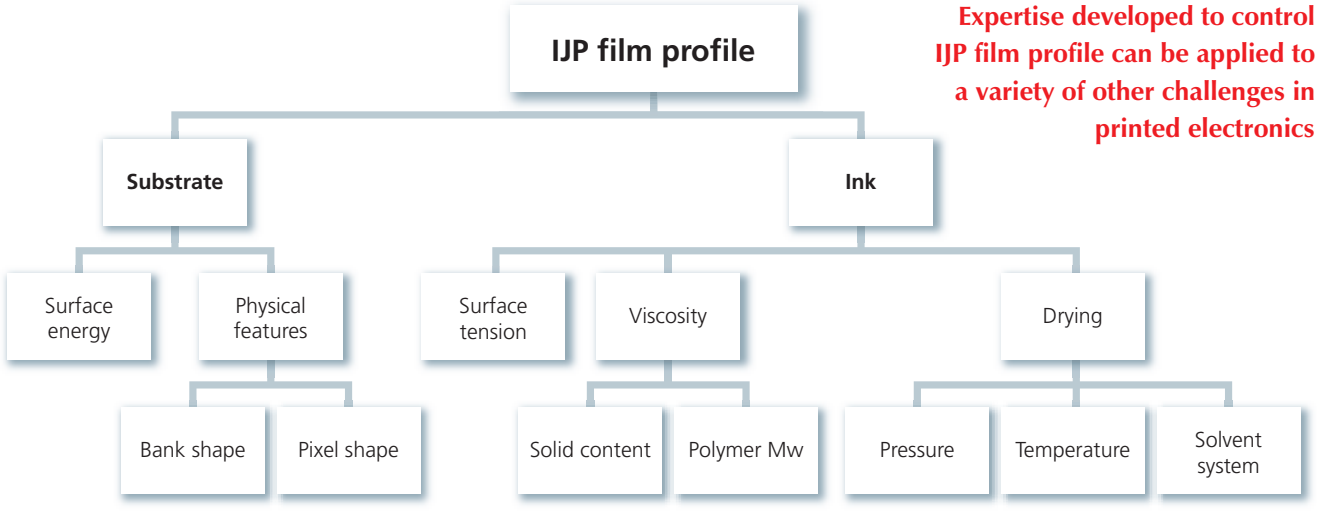
- Our expertise spans the development chain, allowing achievement of exceptional performance from printed layers
- Through our fundamental understanding of device physics, we have developed a combined hole-injection layer and interlayer (hole-transport layer) stack with optimised thickness to realise uniform film thickness profiles, providing uniform emission across inkjet printed pixels
- Required film thickness and uniformity can be achieved by inkjet printing, with a large process window to allow for large scale manufacturing tolerances
- Uniform emission inkjet printed P-OLED devices do not suffer from any additional initial degradation mechanism. With carefully selected materials, inks and processes, long T95 lifetimes (greater than 1000 hours) are achieved with inkjet printed devices, comparable with results from spin coated devices.



Top emission micro-cavity IJP data in simple bank/containment layer



Distance lengthwise across pixel (μm)



Expertise developed to control IJP film profile can be applied to a variety of other challenges in printed electronics

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