



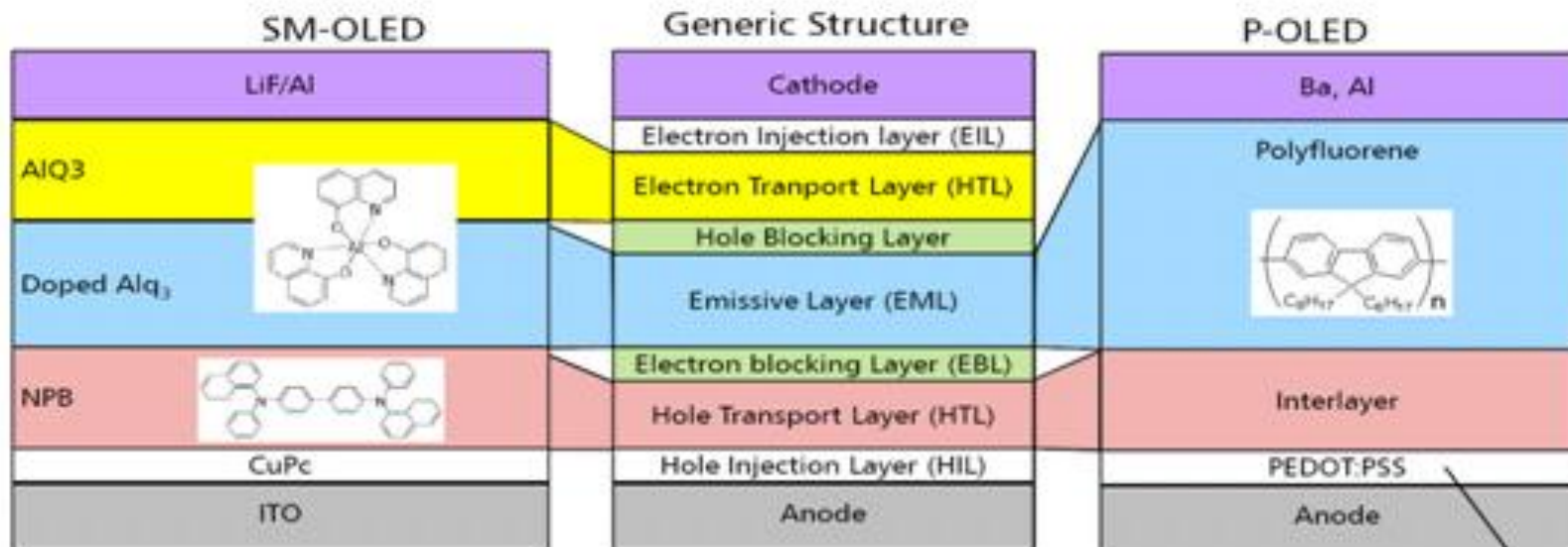
- **Organic solid state lighting**
- **The future?**
- Dr Geoff Williams
- OLED Group Leader
- Thorn Lighting

- What is an Organic LED?
 - Not anything like the veg in the supermarket!!!

OLED Device Structure Variations

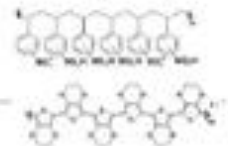
C | D | T

- In reality, a typical OLED device contains additional organic layers to the basic Anode/EML/Cathode structure
- Not all of the layers shown below are used - examples shown below



Multilayers deposited by vacuum deposition

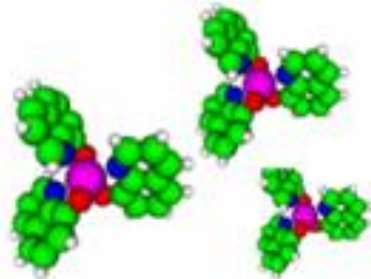
Solution processing requires orthogonal solvents/cross linking



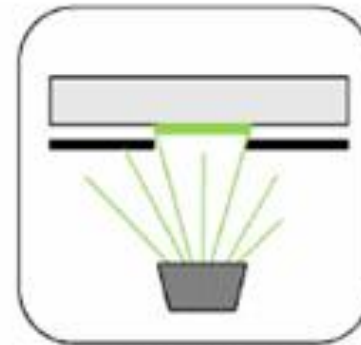
The difference between material classes: Polymers and small molecules

Small Molecule OLEDs (SM-OLEDs)

Invented 1985 by Tang, van Slyke (Kodak)



Emissive materials are small molecules



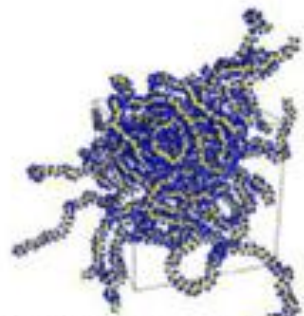
Vacuum deposition

IP now owned by LG

10% -15% material utilisation

Polymer OLEDs (P-OLEDs)

Invented 1989 by Burroughes, Friend, and Bradley (Cambridge)

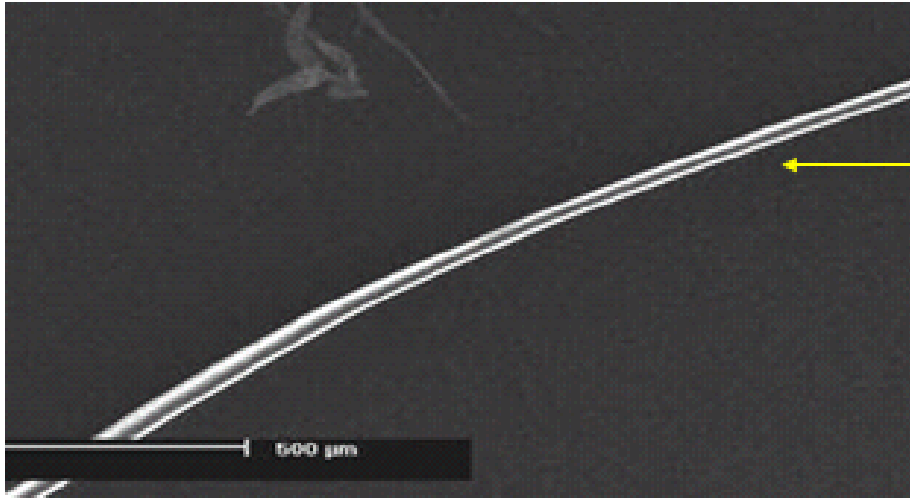


Emissive materials are long chain molecules



Solution processing

90% + material utilisation when printed, not spin coated

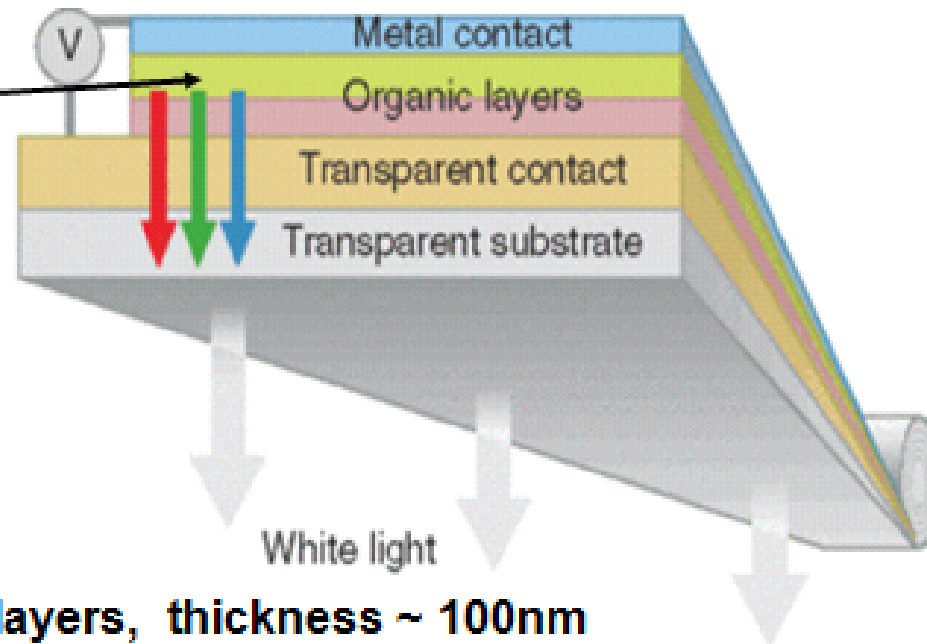


Human hair 0.1 mm thick

Organic layer thickness
1/2000 a human hair!!
0.00005mm (50nm)

Controlled layer thickness to
10% (5nm)

3.5V – 5V dc



Solution processing: three organic layers, thickness ~ 100nm



Topless Lamp

- **White light 5V DC 0.68 Amps 1200cdm-2 CIE (0.364, 0.394)**
- **$\sim 18 \text{ LmW}^{-1}$ with external outcoupling**
- **60Lm delivery ($\sim 1/10$ of a 60W incandescence!)**

- Future Integration of Technologies
 - Pled
 - Photo-voltaic
 - Wind turbine
 - Central battery technology
 - Sensors (OPVs) and controls
- SSL Benefits
 - Integrated systems based on organic and in-organic luminaires
 - Non-metered lighting
 - Lower cost of ownership
 - Better quality white light
 - Lower CO2 footprint
 - Zero Hg
 - Complete recyclability