

# Determination of multilayer structure of OLED by cross-sectional TEM

Organic layers with similar composition can be distinguished by TEM with our original contrast enhancement. By cross-sectional TEM-EDX of the defect which was found in surface SEM, we can reveal the detailed structure and the composition of it.

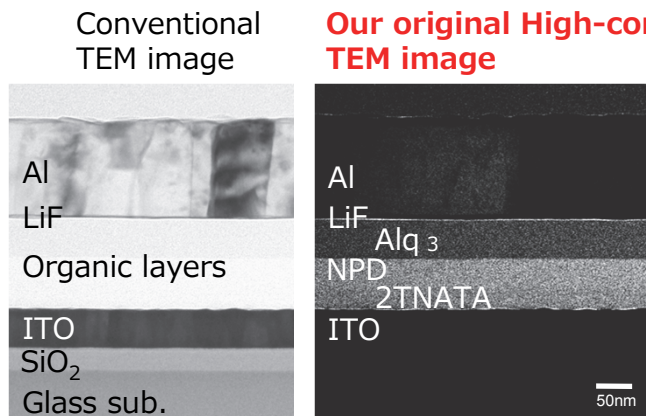
## Multilayer structure of OLED

Cathode	Al
EIL	LiF
EML/ETL	Alq <sub>3</sub> (60nm)
HTL	NPD(40nm)
HIL	2-TNATA(30nm)
Anode	ITO

- Dismantle a panel
- Surface SEM to confirm the small defect
- Make a cross-section of the multilayer of OLED
- TEM analysis

## Analysis 1: Our original method, High-Contrast TEM for OLED

Organic layers with similar composition can not be distinguished with conventional TEM method, but with our original contrast enhancement they can be revealed.

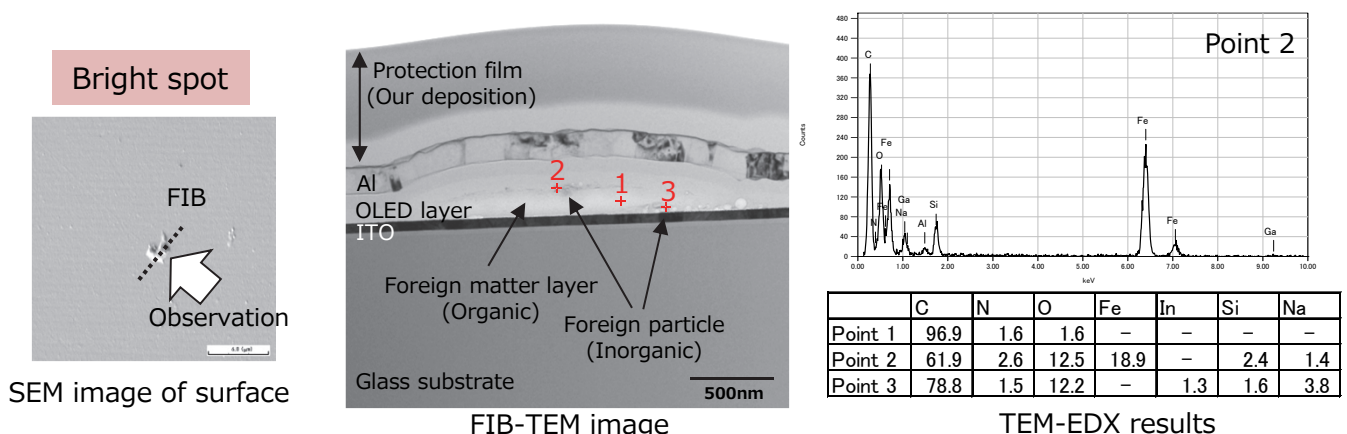


Cross-sectional TEM reveals

- Layer thickness
- Interface structure
- Crystallinity with nanometer-level resolution.

## Analysis 2: Observation of detailed structure of defect (Bright spot)

Cross-sectional TEM-EDX is applied to defects identified by low-voltage imaging-EL.



- A convex-shaped foreign matter is observed under the OLED layer.
- From EDX, the foreign matter is suggested to be hydrocarbon organic matter (point1), which contains impurity elements such as Fe or In (point2, 3).