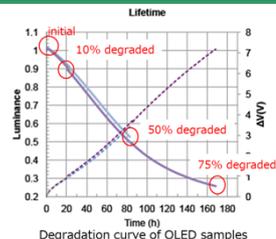
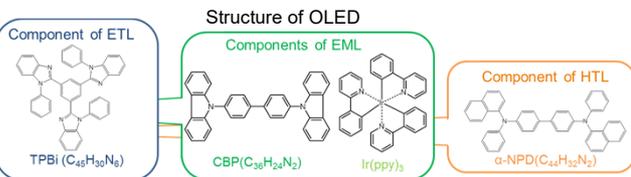
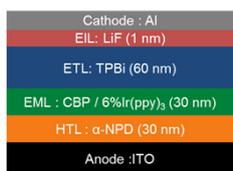


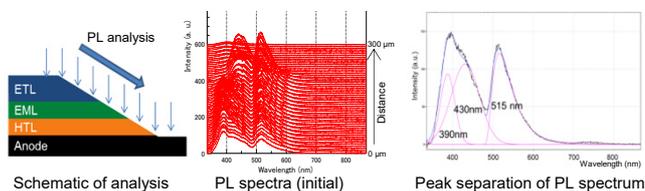
TOF-SIMS MS/MS for analysis of degradation product in OLED driving test

PL line analysis, GCIB-TOF-SIMS, and TOF-SIMS MS/MS were applied to the degradation analysis of OLED in driving test. TOF-SIMS MS/MS revealed the detailed chemical structure of degradation product in the specific depth region in OLED stacks.

■ test pattern size: 2 mmφ ■ driving test: initial, 10%, 50%, and 75% degraded

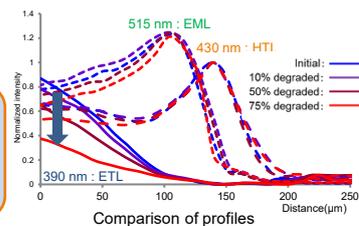


PL analysis of inclined surface



Comparison of profiles of PL intensities

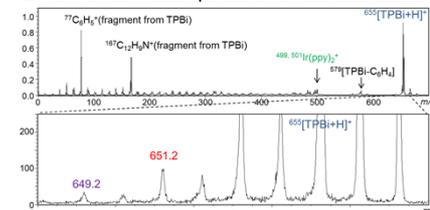
Decrease of peak intensities in ETL ⇒ Degradation of ETL components



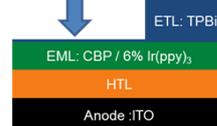
TOF-SIMS MS/MS

Ar-GCIB etching to ETL/EML interface ⇒ TOF-SIMS analysis

■ TOF-SIMS mass spectra of ETL/EML interface

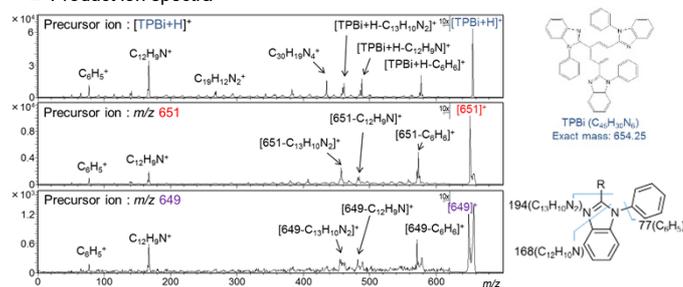


Measurement



Insufficient information in MS spectra ⇒ MS/MS analysis

■ Product ion spectra

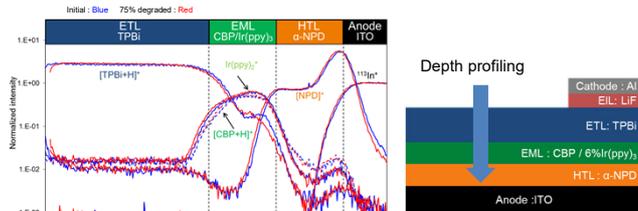


Degradation products can be assigned as derivatives of TPBi, [TPBi-4H] and [TPBi-6H].

Peaks in low m/z were common. Shifts of peaks in high m/z were common.

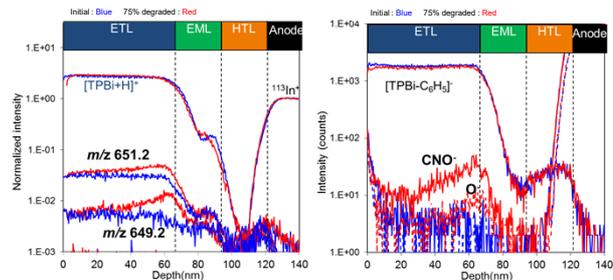
⇒ Cyclization of TPBi

GCIB-TOF-SIMS depth profile of OLED



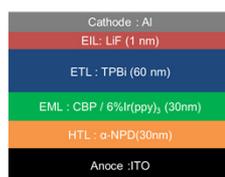
Intensities of main components and dopant were not changed after degradation.

Difference between the spectra of each layer ⇒ Depth profile



Degradation at EML ~ EML/ETL interface ⇒ Corresponding with PL results, m/z 649, 651 peaks were obtained from degradation products

Summary



An example of [TPBi-4H]

PL line analysis, GCIB-TOF-SIMS, and TOF-SIMS MS/MS were applied to OLED degradation analysis. These techniques revealed the detailed chemical structure of the degradation product in the specific depth region in OLED stacks.