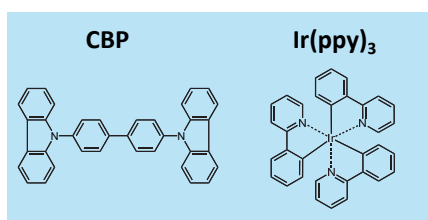


Quantification of dopant in phosphorescent OLED device by using GCIB-TOF-SIMS

Generally, EML of OLED device consists of host material and light-emitting molecule doped in low concentration. Concentration of dopant is important parameter because it can affect to efficiency and life time of device. We have developed quantification method and obtained the depth distribution of the dopant concentration in EML by using GCIB-TOF-SIMS.

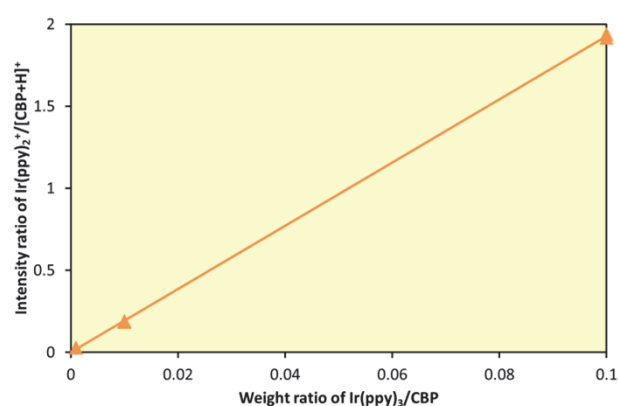
Calibration curve

Co-deposited thin films of CBP : Ir(ppy)₃ on glass substrate in various weight ratio of Ir(ppy)₃/CBP were used to make a calibration curve.

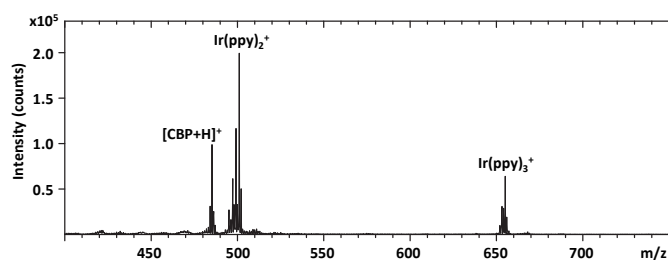


Calibration curve was prepared as a correlation between TOF-SIMS intensity ratio of Ir(ppy)₂⁺/[CBP+H]⁺ and weight ratio of Ir(ppy)₃/CBP.

This curve showed good linearity in the range of Ir(ppy)₃/CBP=0.001-0.1.



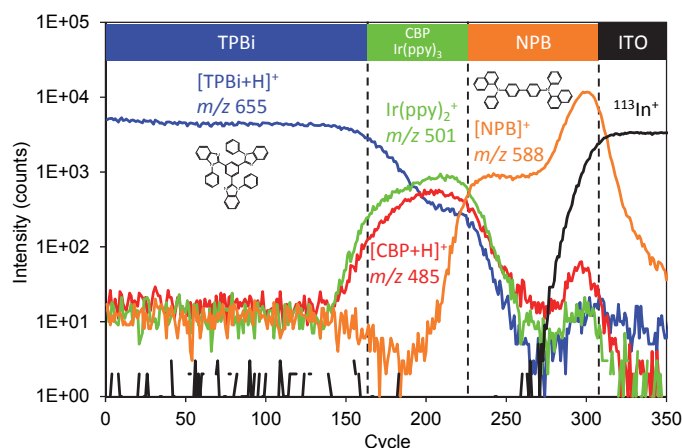
Calibration curve of Ir(ppy)₃ in CBP



TOF-SIMS positive ion spectrum of CBP:Ir(ppy)₃ (ratio = 1:0.1)

Quantification of dopant in OLED device

We obtained depth profile of each component of OLED multi-layer stack by GCIB-TOF-SIMS.

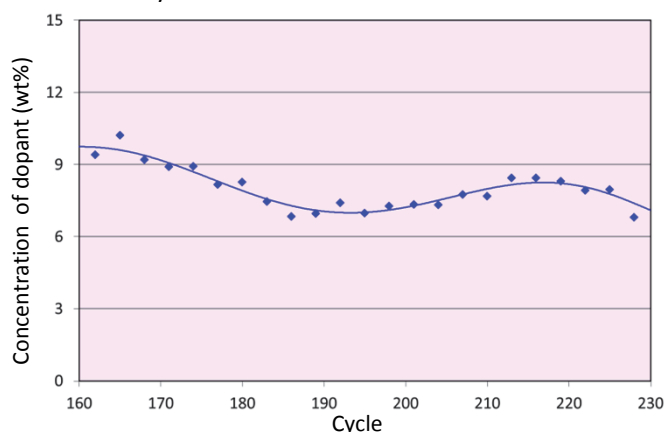


GCIB-TOF-SIMS depth profile of OLED device

Layer construction of OLED device

Cathode : Al (* peeled off before analysis)
ETL : TPBi
EML : 6wt% Ir(ppy)₃ in CBP
HTL : NPB
Anode : ITO

We quantified the dopant in EML by conversion from intensity ratio with the calibration curve above.



Depth distribution of dopant concentration in EML

Depth distribution of dopant shows that the dopant concentration is lower in the middle of EML than upper side and lower side.

Averaged concentration of dopant is 8.0wt%, which is higher than the set value of the concentration: 6wt%.