# Enhanced stability of organic light-emitting devices fabricated under ultra-high vacuum condition

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Degradation in OLEDs essentially appears in the form of a decrease in luminance in time. The degradation phenomena in OLEDs can be classified in three modes; dark-spot formation, catastrophic failure, and intrinsic degradation. Among these modes, the intrinsic degradation, where the brightness of the emissive area of a device gradually decreases without any obvious change in device appearance, is the largest obstacle to be overcome.

In this study, we report that influence of residual gas component on the operation stability of the organic light-emitting devices (OLEDs) based on tris (8-hydroxyquinoline) aluminum ($Alq_3$). The devices stability depends on the background pressure during the device fabrication. Lower background pressure results in the stable devices. In sharp contrast, the differences in the current density -- voltage - luminance characteristics were marginal in all devices. Analyses with a quadrupole mass spectrometer indicate that the primary difference of the background pressure was attributed to the amount of residual water. When the background pressure was regulated to the same range, lower amount of residual water results in the stable devices. Results show that the degradation of the OLEDs is associated with the electrochemical reaction of $Alq_3$ with water.

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