

Electronic Structures of OLED cathode interfaces Ca/LiF/Alq3 and Ca/NaF/Alq3

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We have studied the interface electronic structures of Ca/LiF/tris-(8-hydroxyquinoline)Al (Alq3) and Ca/NaF/Alq3 using X-ray and ultraviolet photoelectron spectroscopy (XPS and UPS). The UPS revealed that the deposition of Ca on LiF/Alq3 or NaF/Alq3 created gap states between Fermi level and highest occupied molecular orbital (HOMO) peak of Alq3. The N 1s core level peak measured with XPS exhibited large satellite peak with Ca deposition. The satellite peak intensity increased with Ca thickness, eventually dominating the original N 1s peak at about 2.0 nm of Ca. Such a strong satellite peak was not generally observed for Ca/Alq3, suggesting that the presence of LiF mediates the transfer of charges from Ca. We could not find any definitive evidence that the Li atoms in LiF are liberated after the deposition of Ca and react directly with Alq3. The formation of Ca cluster is evidenced from the continuously decreasing Ca 2p binding energy with Ca thickness.