Electronic Supplementary Material (ESI) for Nanoscale.

Quantum-dot Light Emitting Diodes with Perfluorinated Inomer doped Copper-Nickel Oxide Hole Transporting Layer

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Keywords: All inorganic, All solution process, Metal oxide, Quantum-dot, QLED

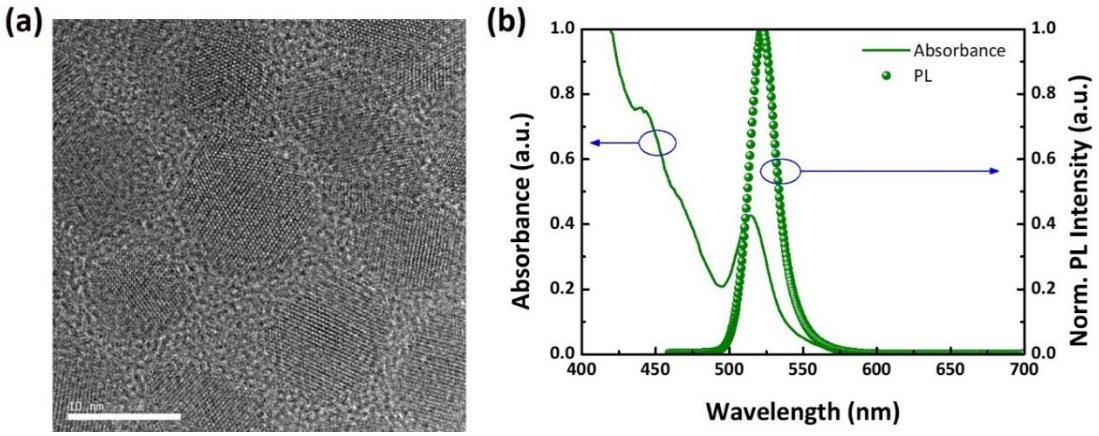

Figure S1. (a) Top-viewed TEM image and (b) optical characteristics of G-QDs used in this study.

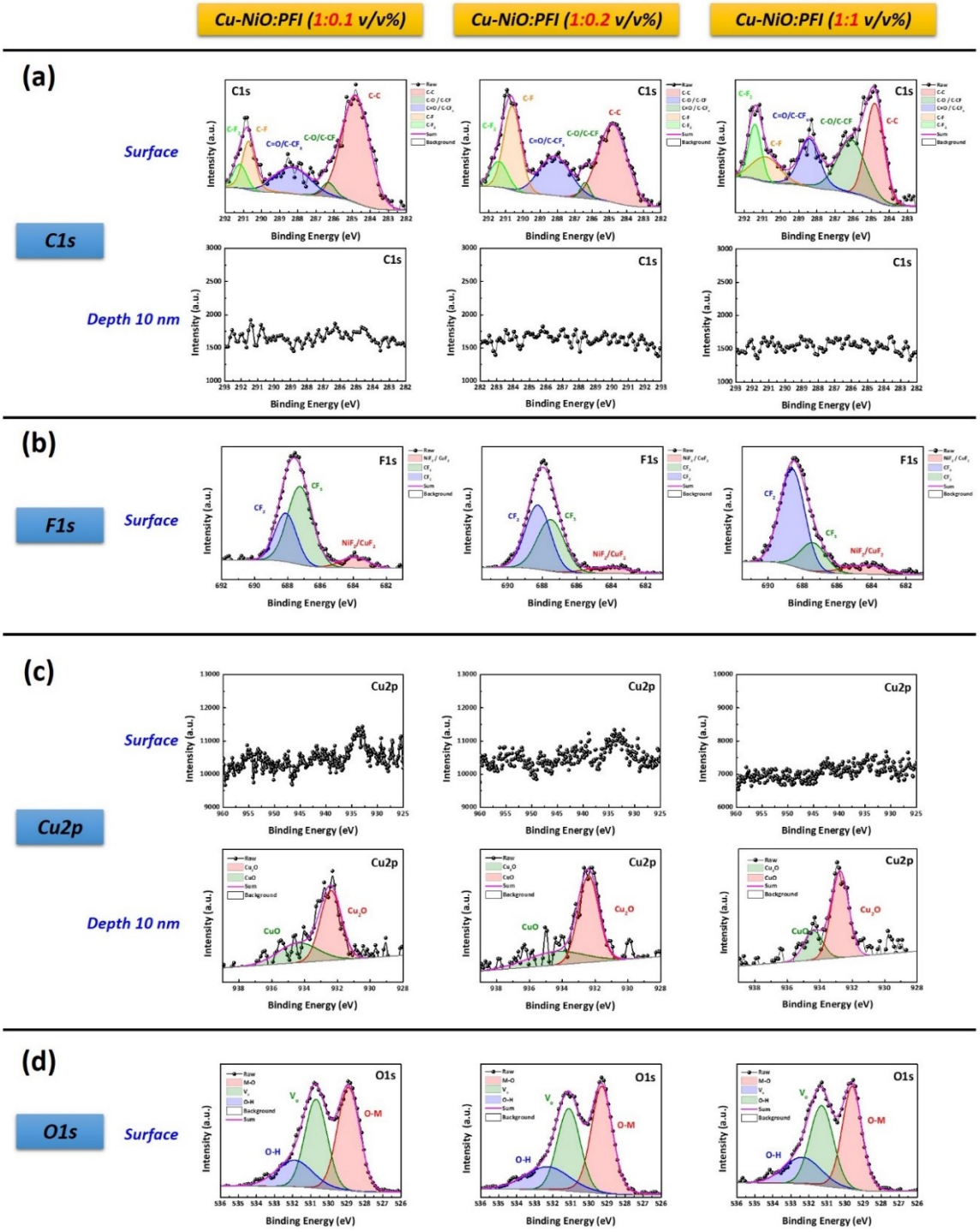

Figure S2. XPS depth profiles of Cu-NiO:PFI layers with varying PFI blending ratio. Atomic binding energies of (a) C1s core level on surface and 10 nm depth, (b) F1s core level on surface, (c) Cu2p core level on surface and 10 nm depth and (d) O1s core level on the surface. As shown in Figure S2(a) and S2(b), F atoms and metal-oxides are mainly formed on the surface of Cu-NiO:PFI, while Cu atoms exist under 10 nm depth from the surface. Therefore, the F bonding and NiO fully cover the HTL surface.

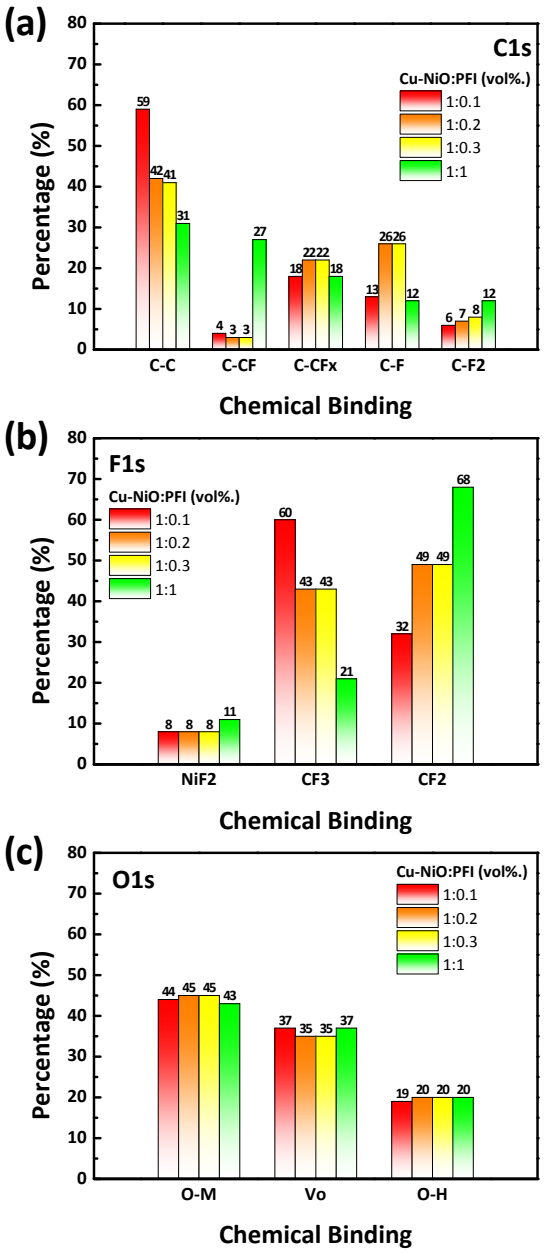

Figure S3. Distribution of chemical bindings at C1s, F1s and O1s core levels of surface obtained from XPS results in Figure S2. (a) C-C, C-CF, C-CF_x, C-F and C-F_2 bindings at C1s core level, (b) NiF_2, CF_3 and CF_2 bindings at F1s core level and (c) O-M, V_o and O-H bindings at O1s core level.

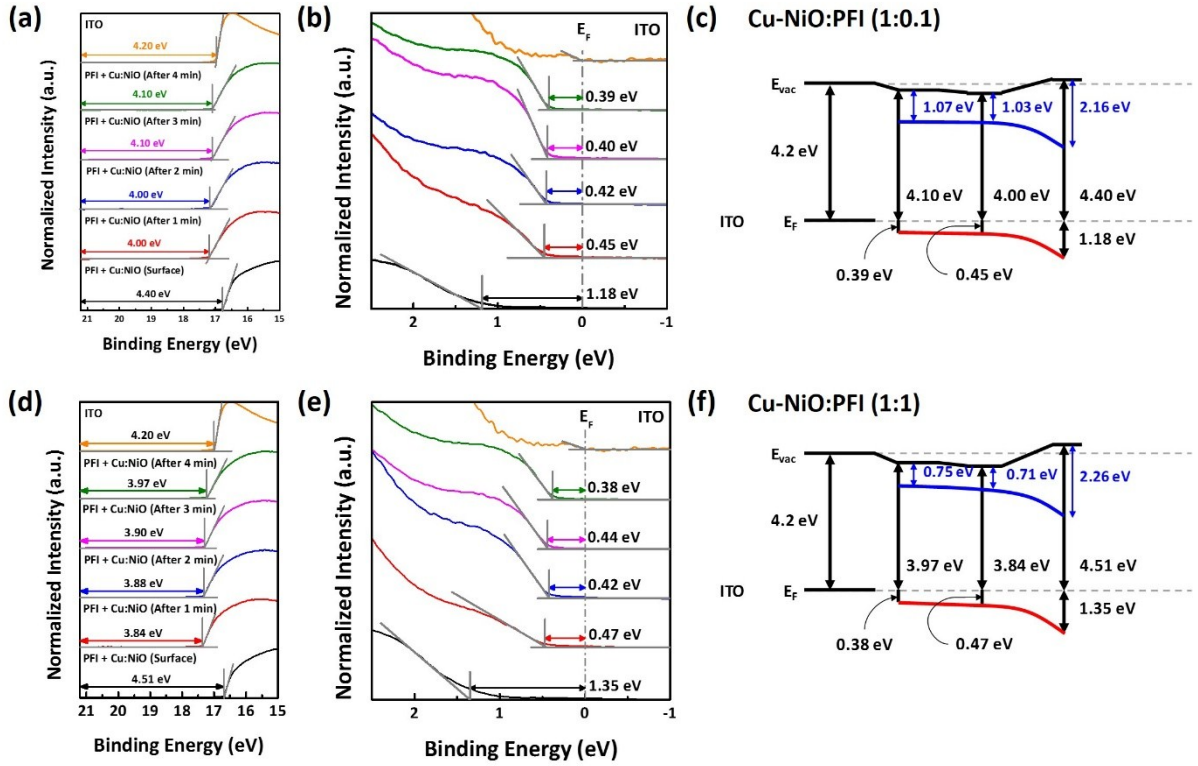

Figure S4. He (I) UPS spectra of (a) secondary-electron cutoff regions, (b) Fermi-edge regions and (c) energy band diagram of Cu-NiO:PFI (1:0.1 v/v%) thin-films on ITO with depth profile. He (I) UPS spectra of (d) secondary-electron cutoff regions, (e) Fermi-edge regions and (f) energy band diagram of Cu-NiO:PFI (1:1 v/v%) thin-films on ITO substrate with depth profile.

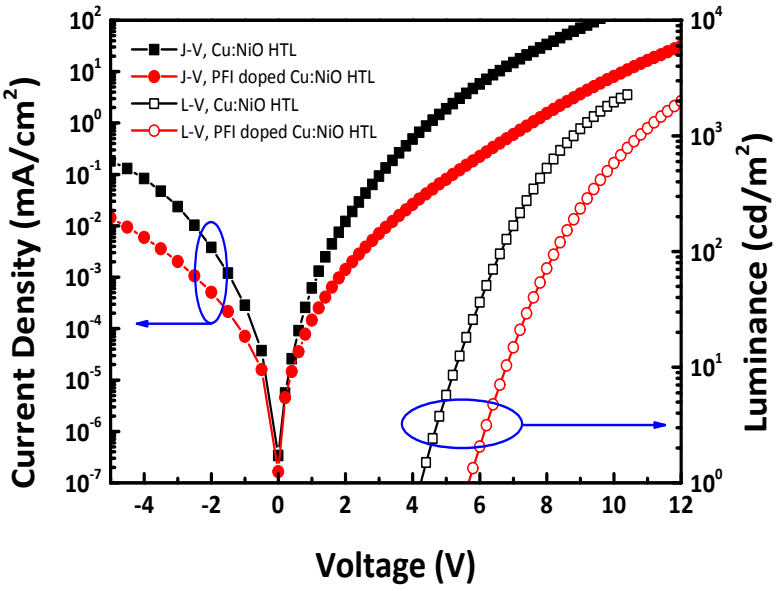

Figure S5. Current density and luminance characteristics of QLEDs as function of applied voltage in semi-log scale.

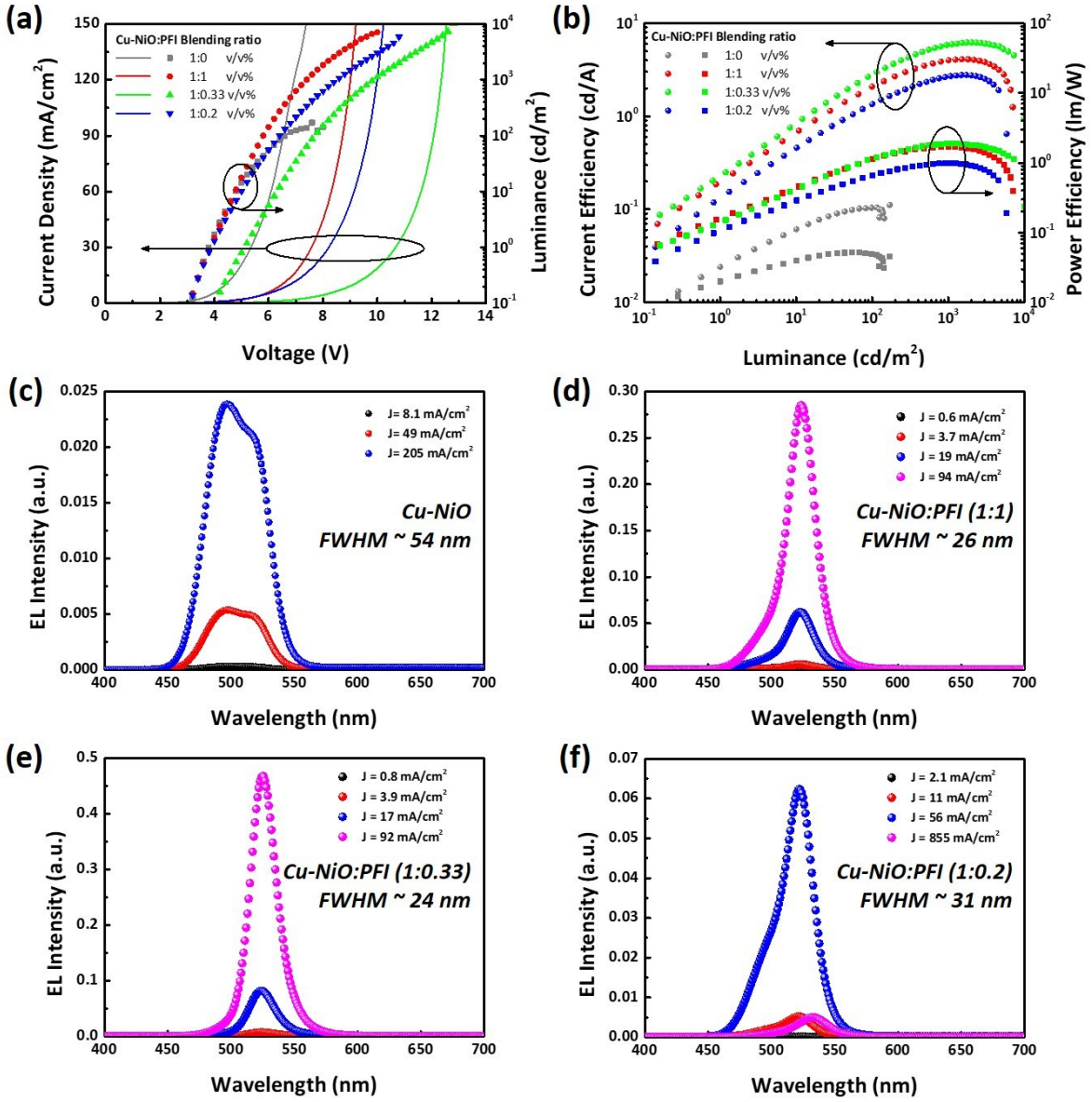

Figure S6. Device performance of all solution processed QLEDs with various PFI blending ratios (v/v %) in Cu-NiO. (a) Current density and luminance versus voltage and (b) current and power efficiencies versus luminance characteristics of all solution processed QLEDs. EL spectra of all solution processed QLEDs with (c) Cu-NiO:PFI (1:0 v/v%), (d) Cu-NiO:PFI (1:1 v/v%), (e) Cu-NiO:PFI (1:0.33 v/v%) and (f) Cu-NiO:PFI (1:0.2 v/v%) HTLs.