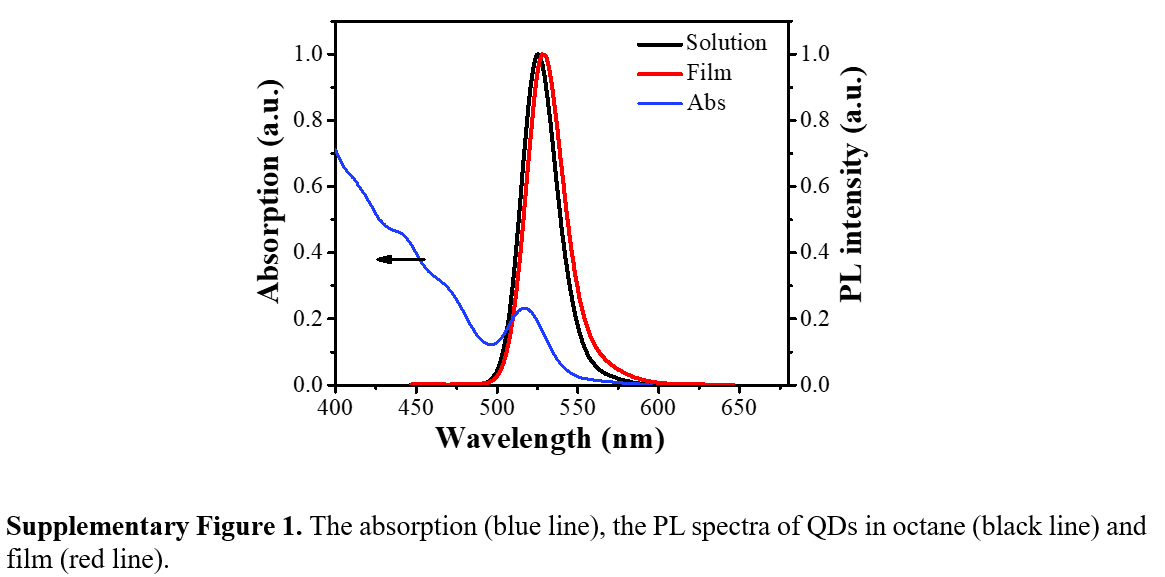
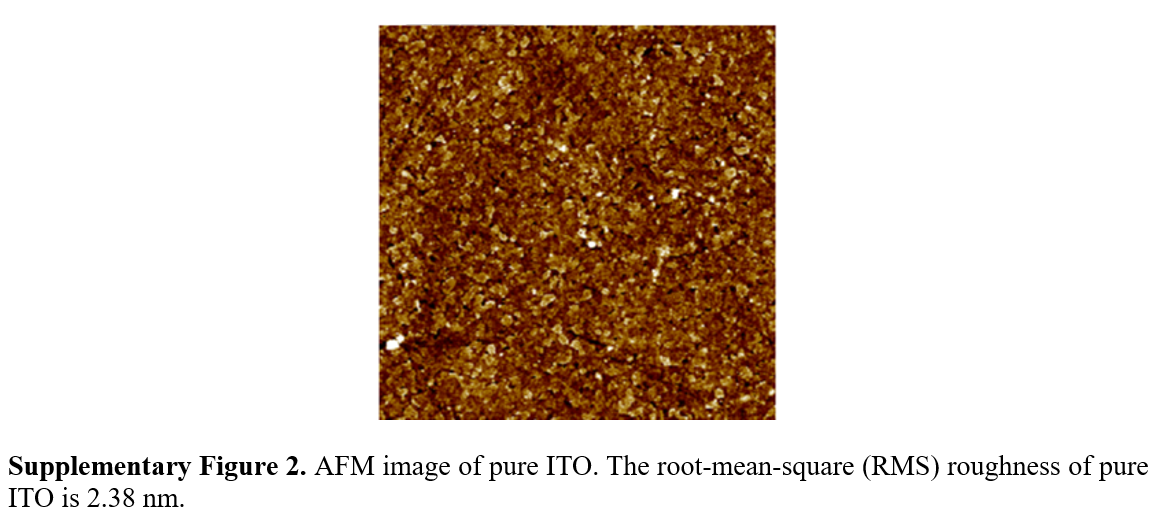
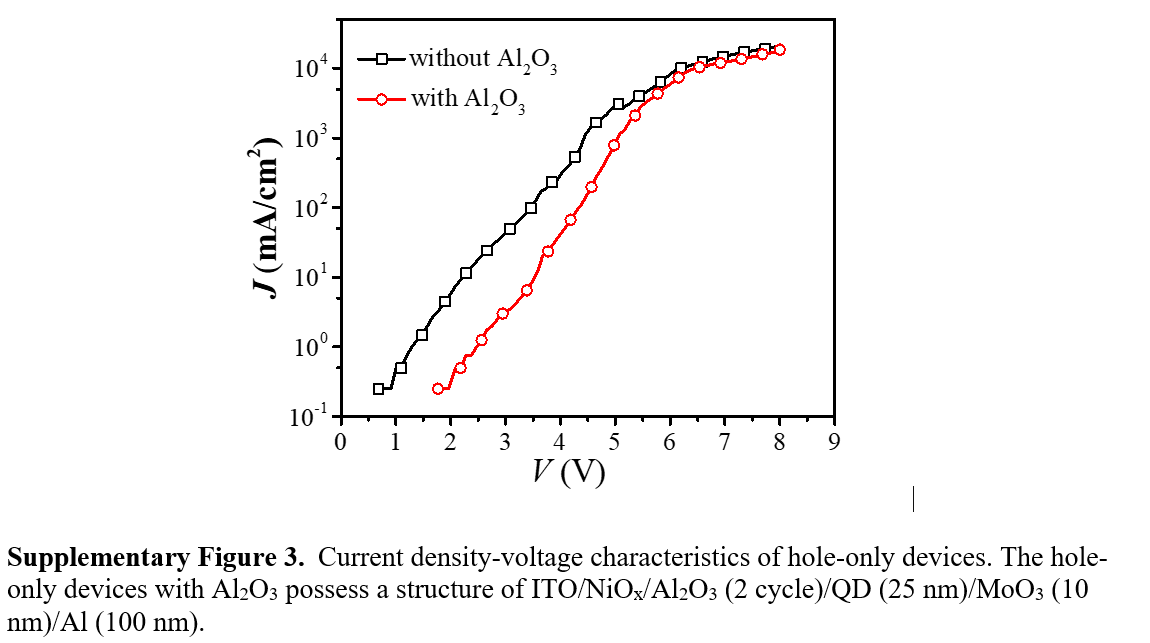
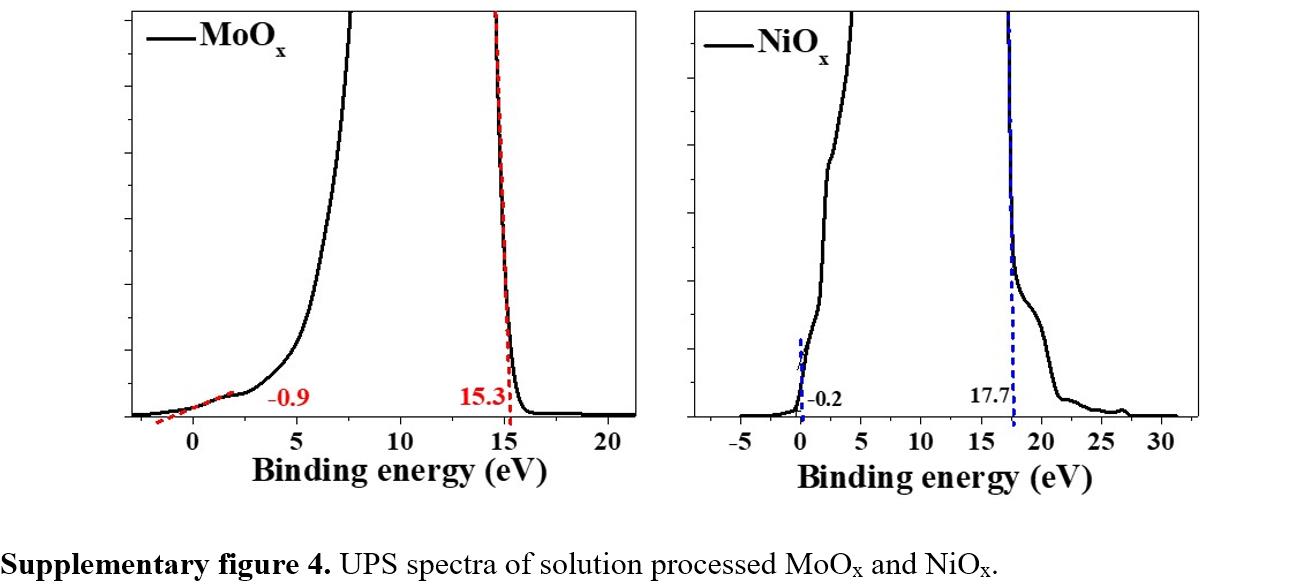
Supplementary Material









**Supplementary Table 1**. Summary of the electrical properties of the QLEDs with different cycles of Al2O3.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| device | VT (V) | Lmax (cd/m2) | EQEmax (%) | *η*A (cd/A) | *η*P (lm/W) |
| 0C | 4.1 | 590 (5.9 V) | 1.4 (4.4 V) | 5.4 (4.4 V) | 3.7 (4.4 V) |
| 1C | 4.2 | 4070 (7.3 V) | 3.3 (5.2 V) | 12.0 (5.2 V) | 7.2 (5.2 V) |
| 2C | 4.3 | 4540 (7.5 V) | 3.5 (5.5 V) | 12.8 (5.5 V) | 7.5 (5.4 V) |
| 3C | 4.4 | 3120 (7.9 V) | 2.4 (5.3 V) | 9.0 (5.7 V) | 5.3 (5.2 V) |

**Supplementary Table 2.** Comparison of the performance of all-inorganic QLEDs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device Structure** | **Peak Emission**  **[nm]** | **EQE**  **[%]** | **Brightness**  **[cd/m2]** | **Reference** |
| ITO/NiO1/QDs/ZnO:SnO2/Al | 638 | 0.1 | 1950 | Nano Letters 2006, 6 (12), 2991–2994 |
| ITO/NiO2/QDs/ZnO/Al | 628 | 0.01 | 249 | J. Mater. Chem. 2009, 20 (1), 167–172 |
| ITO/NiO2/Al2O32/QDs/ZnO/Al | 530 | **-----** | >2000 | ACS Photonics 2017, 4 (5), 1271–1278. |
| ITO/MoO3/NiO2/LiF3/QDs/Al2O32/ZnO/Al | 508 | 6.52 | 21600 | Nano Energy 2018, 46, 229–233 |
| ITO/NiO2/QDs/ZnO/Al | 533 | **-----** | 4205 | ACS Applied Materials & Interfaces 2018,  10 (17), 14894–14900 |
| ITO/NiO2/Al2O34/QDs/ZnO/Al | 527 | 8.1 | 14713 | Nanoscale 2018, 10 (23), 11103–11109. |
| ITO/Ni0.88Mg0.12O1/MgO1/QDs/ZnMgO/Al | 535 | 1.47 | 40000 | ACS Appl. Mater. Interfaces 2019,  11 (12) 11119-11124 |
| ITO/sMoO3/NiOx2/Al2O34/QDs/ZnO/Al | 534 | 5.5 | 9140 | This work |