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All-inorganic QLEDs Based on Perovskite Emitters with High Humidity/water Stability

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Figure S1

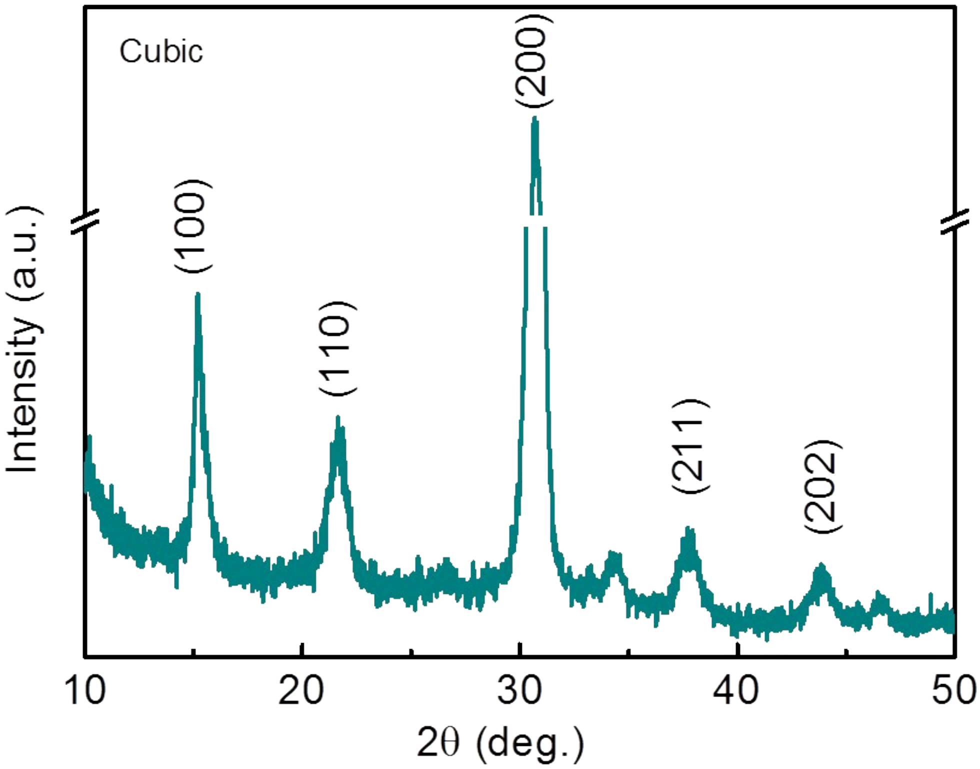

Figure S1. The XRD pattern of perovskite $CsPbBr_3$ QDs film.

Figure S2

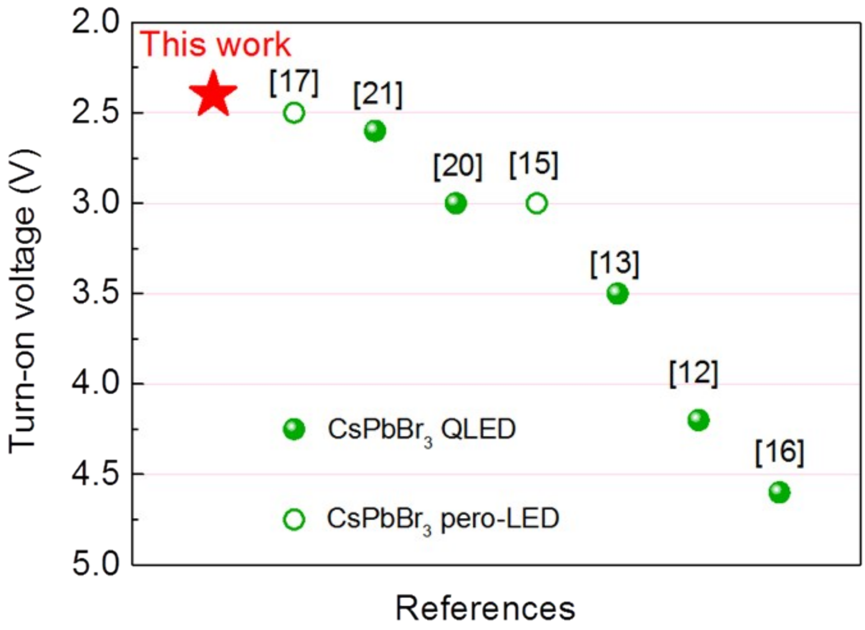

Figure S2. Comparison of turn-on voltages of the reported $CsPbBr_3$ QLEDs including this work.

Figure S3

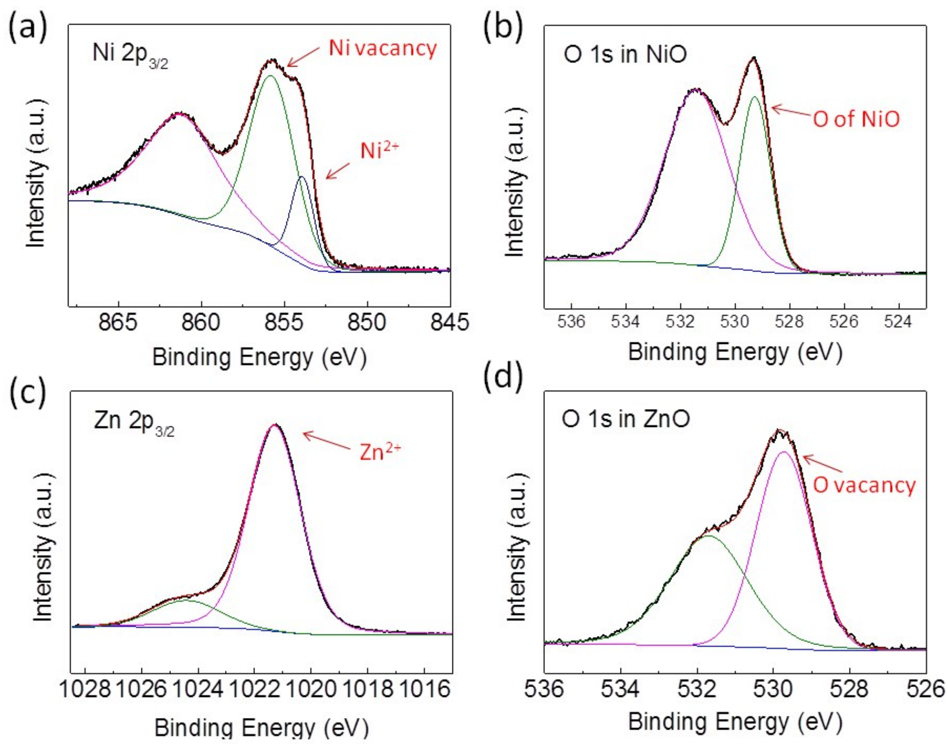

Figure S3. XPS spectra of the Ni 2p3/2 peaks a) and O 1s peaks b) of the NiO films and Zn $2p_{3/2}$ c) and O 1s d) of ZnO films.

Figure S3a presents Ni $2p_{3/2}$ XPS spectra of the NiO_X film, the peak centred at 853.9 eV belongs to Ni^{2+} and the peak centred at 855.8 eV can be attributed to Ni^{3+} which was induced by the interstitial oxygen defects or Ni vacancy. The broad peak located at 861.2 eV can be ascribed to a shake-up process in the NiO structure.[1] The O 1s XPS spectra of NiO_X are shown in Figure S3b, the peak centred at 531.5 eV probably caused by nickel hydroxides and oxyhydroxides,[2] for the NiO film with defects will chemical adsorb water and form surface hydroxide during exposed to atmospheric conditions. The peak centred at 529.3 eV originates from the lattice O atoms of NiO. Figure S3c presents Zn $2p_{3/2}$ XPS spectra of the ZnO film. The peak centred at 1021.2 eV pertains to Zn $2p_{3/2}$, while the shoulder peak located at 1024.4 eV may be related to interstitial Zn atoms[3-4]. The XPS spectra of O 1s peaks are shown in Figure S3d, the peak located at 529.7 eV was ascribed to Zn–O bonds in ZnO crystal. The peak centred at 531.7 eV is related to oxygen-deficient regions within the ZnO film.[5]

Figure S4

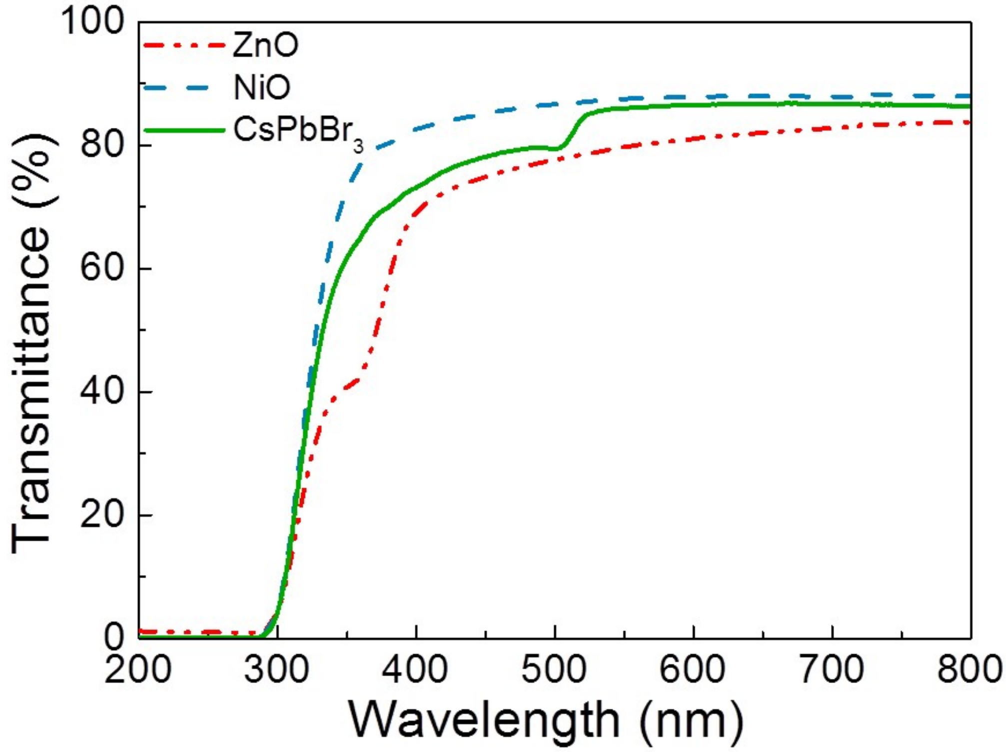

Figure S4. The optical transmittance spectra of $CsPbBr_3$ QDs, NiO and ZnO films.

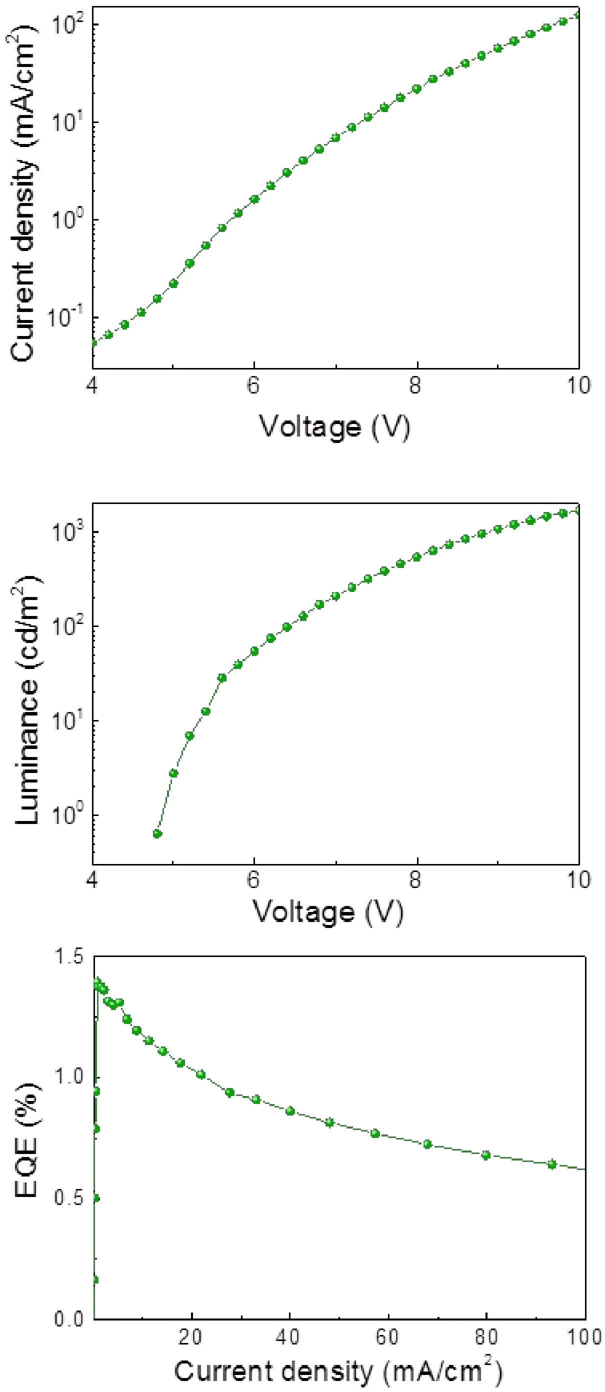

Figure S5. The performance of QLEDs based on OCTLs

Video S1 showing the all-inorganic QLEDs working under water over time (avi)

Video S2 showing the QLEDs with organic CTLs working under water over time (avi)

REFERENCES

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