Supporting Information

Passivation layers for nanostructured photoanodes: ultra-thin oxides on InGaN nanowires

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S1. Bias Dependent PL and PC of Al₂O₃-Coated InGaN NWs

Al₂O₃-coated samples show almost no bias dependence in PC and PL measurements, suggesting that a change in band bending induced by the applied bias has only small influence on the amount of carrier transfer into the electrolyte. This supports the assumption that band transfer from the InGaN material into the Al₂O₃ coating is suppressed.

Figure S1. Bias dependent measurements of PC and PL on Al₂O₃-coated InGaN nanowires compared to the uncoated reference sample. (a) Illuminated with a 523 nm LED; (b) Illuminated with a 405 nm laser diode.
S2. Photocurrent of 10 nm Al₂O₃-coated InGaN Nanowires

For 10 nm Al₂O₃-coated samples no PC was observed. This supports the theory that the hole transfer is blocked by the valence band offset and also that the hole transport in the case of nominally 5 nm thick Al₂O₃ coatings is caused by tunnelling through thin areas of the coating that exist due to the surface roughness.

![Image of photocurrent measurement](image)

**Figure S2.** Photocurrent of 10 nm Al₂O₃-coated sample compared to uncoated reference sample. Measurement at 700 mV.

S3. EELS of CeO₂-Coated InGaN NWs

The EELS measurement of CeO₂-coated NWs shows a high Ce³⁺ signal, especially at the surface documenting a high degree of Ce³⁺ defects/sites and resulting oxygen vacancies in the ceria coating.

![Image of EELS mapping](image)

**Figure S2.** EELS mapping of CeO₂-coated InGaN nanowires. The area marked in (a) was investigated in (b-g). In (e) the Ce⁴⁺ and Ce³⁺ signals are separated. Original Ce⁴⁺ and Ce³⁺ spectra are displayed in (f) and (g) resp.
S4. Tauc Plots for Determination of Band Gaps

Figure S3. Tauc-Plots for the determination of the indirect band gaps of CeO$_2$ and TiO$_2$. Transmission measurements were performed on 5 nm thin oxide films prepared with ALD on quartz glass.