

Supplementary information

Spatial surface charge engineering for electrochemical electrodes

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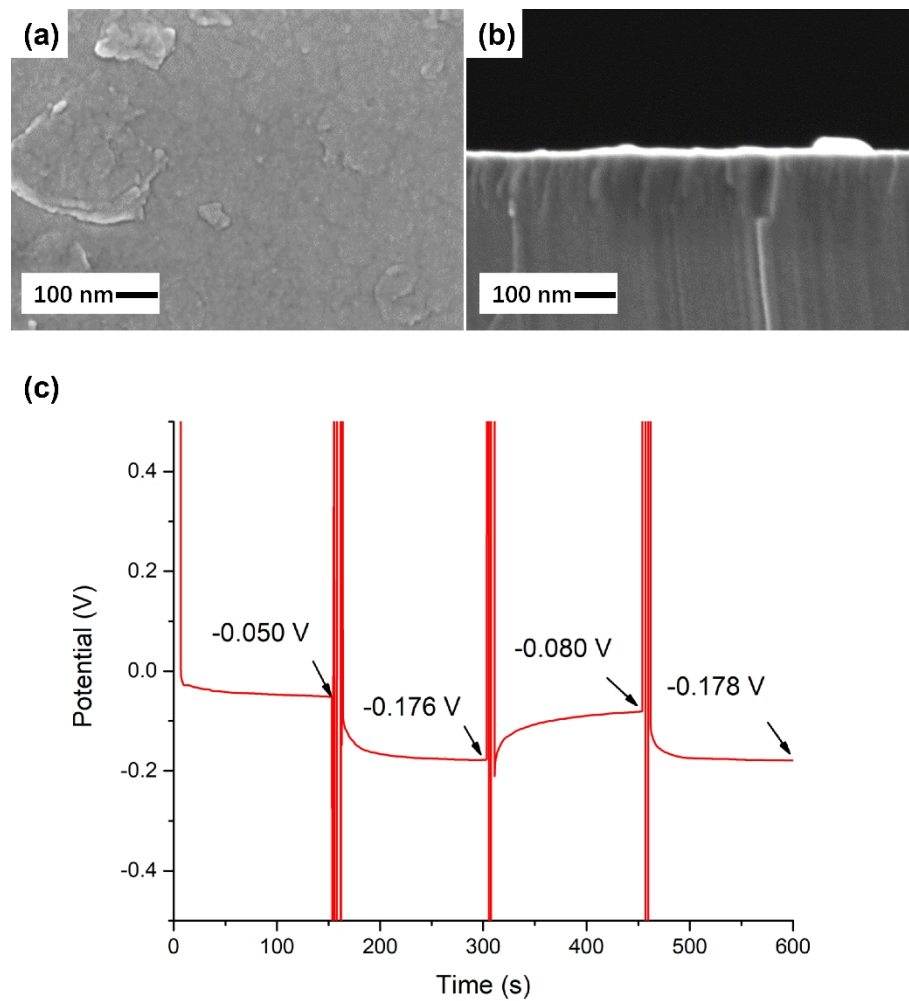


Figure S1. InN/InGaN structure on GaN/sapphire at the critical thickness of quantum dot formation and open circuit potential. (a) Top-view and (b) cross-sectional SEM images of the 0.8-ML-InN/130-nm-In_{0.45}Ga_{0.55}N sample grown on a GaN/sapphire substrate. Onset of QD formation is observed. (c) OCP as a function of time for the InN/InGaN electrode and Ag/AgCl reference electrode immersed alternately for 150 seconds in 0.1 and 1 M KCl aqueous solutions.

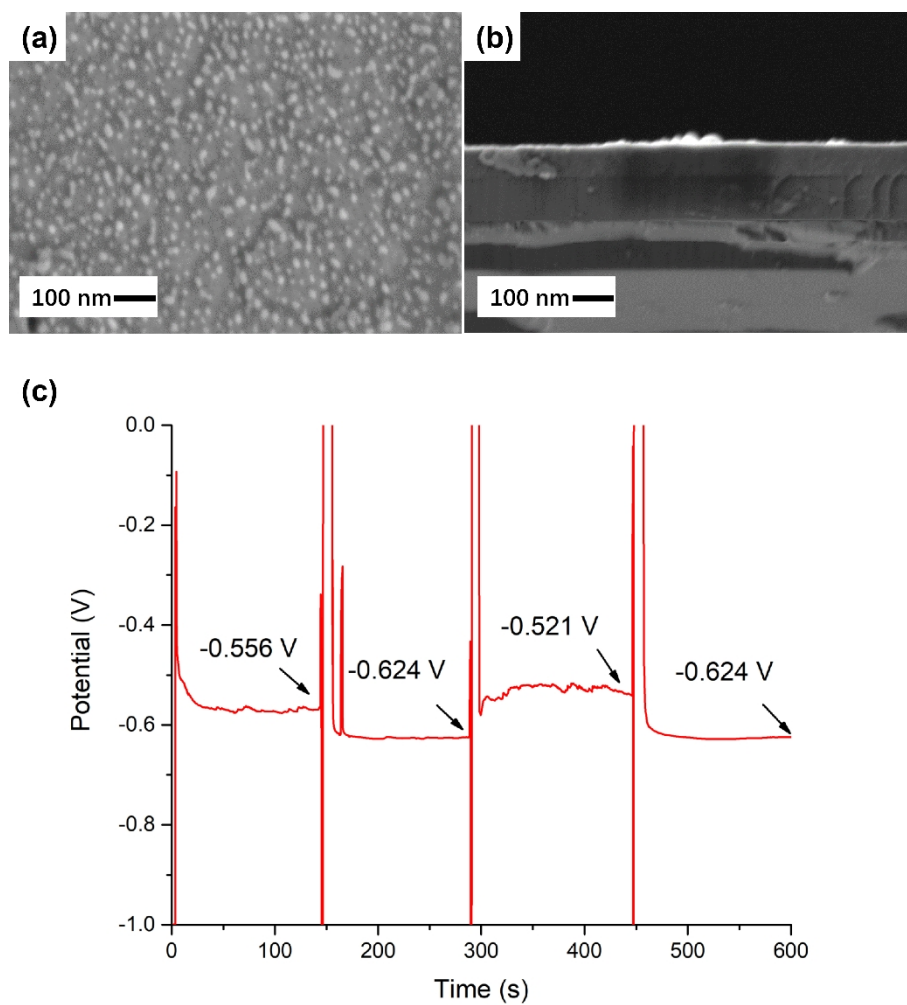


Figure S2. InN/InGaN structure on GaN/sapphire with clear quantum dot formation and open circuit potential. (a) Top-view and (b) cross-sectional SEM images of the 1.2-ML-InN/130-nm- $\text{In}_{0.45}\text{Ga}_{0.55}\text{N}$ sample grown on a GaN/sapphire substrate. Clear QD formation is observed. (c) OCP as a function of time for the InN/InGaN electrode and Ag/AgCl reference electrode immersed alternately for 150 seconds in 0.1 and 1 M KCl aqueous solutions.

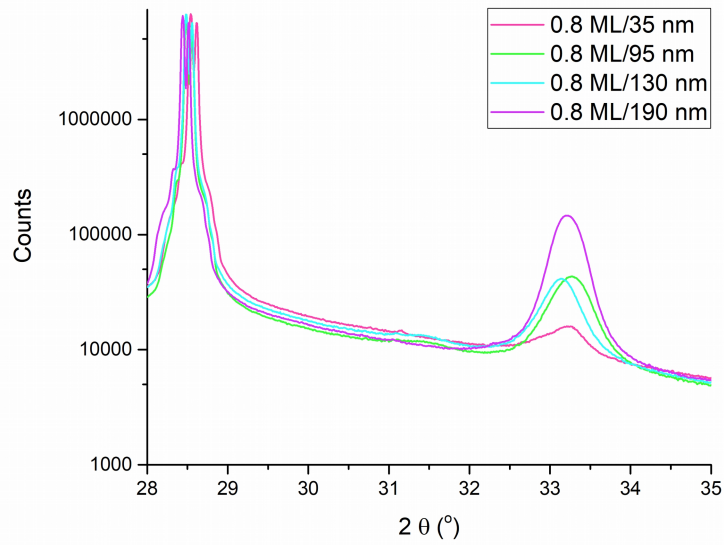


Figure S3. XRD spectra recorded around the symmetric Si (111) Bragg reflection of samples: 0.8-ML-InN/35-nm-InGaN (red line), 0.8-ML-InN/95-nm-InGaN (green line), 0.8-ML-InN/130-nm-InGaN (blue line), and 0.8-ML-InN/190-nm-InGaN (violet line).

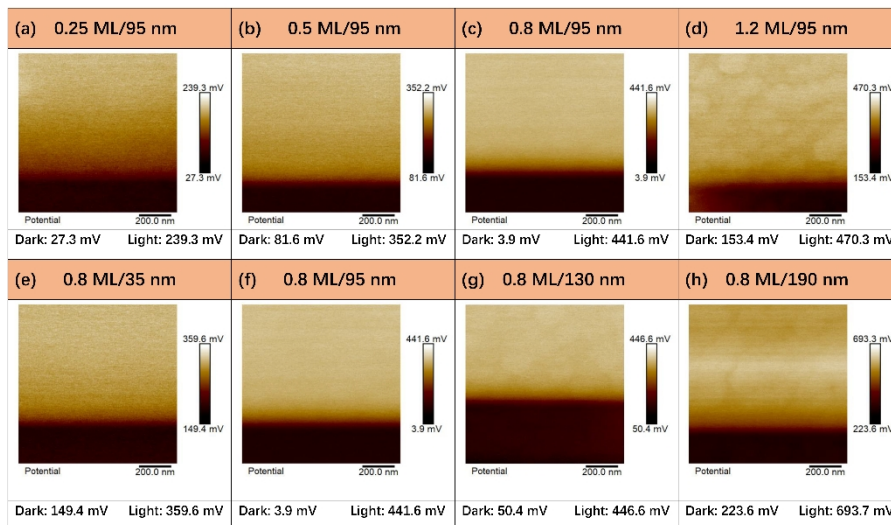


Figure S4. KPFM images and relative surface potentials of samples (a) 0.25-ML-InN/95-nm-InGaN, (b) 0.5-ML-InN/95-nm-InGaN, (c) 0.8-ML-InN/95-nm-InGaN, (d) 1.2-ML-InN/95-nm-InGaN, (e) 0.8-ML-InN/35-nm-InGaN, (f) 0.8-ML-InN/95-nm-InGaN, (g) 0.8-ML-InN/130-nm-InGaN, and (h) 0.8-ML-InN/190-nm-InGaN.

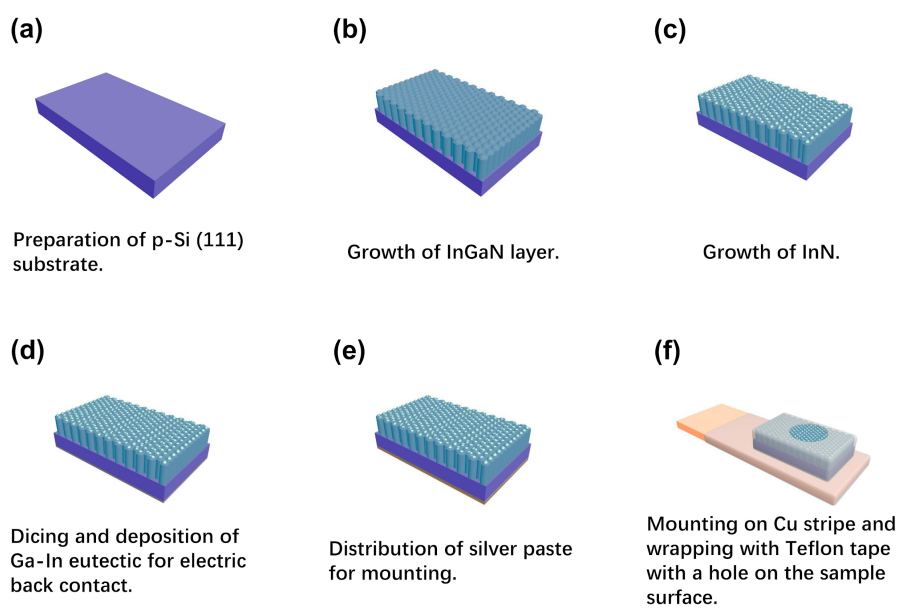


Figure S5. Schematic drawings of the (a-c) growth process and (d-f) electrode fabrication.

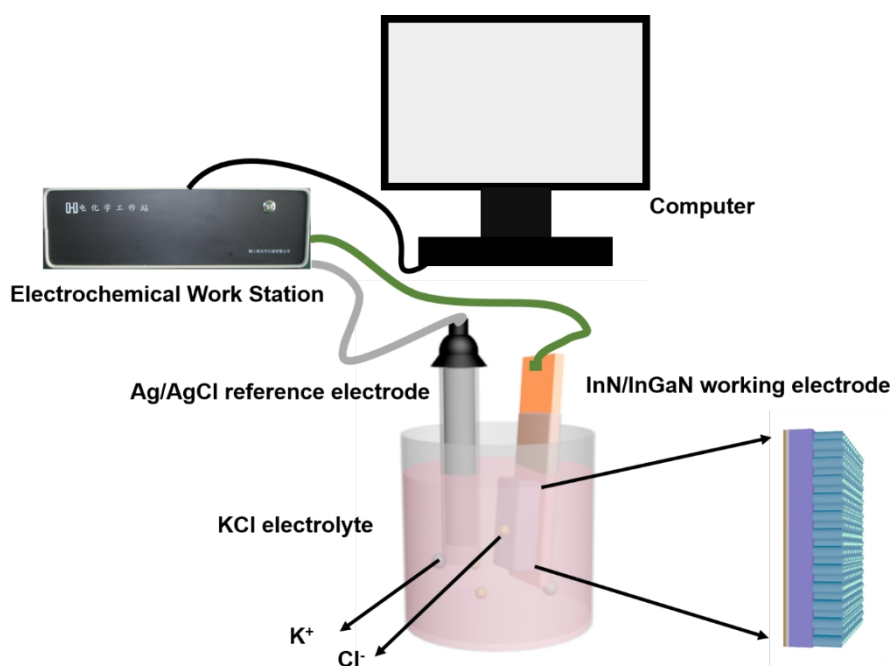


Figure S6. Schematic drawing of the measurement setup.