

Supporting Information

Multifunctional Tunable Cu₂O and CuInS₂ QDs on TiO₂ Nanotubes for Efficient Chemical Oxidation of Cholesterol and ibuprofen

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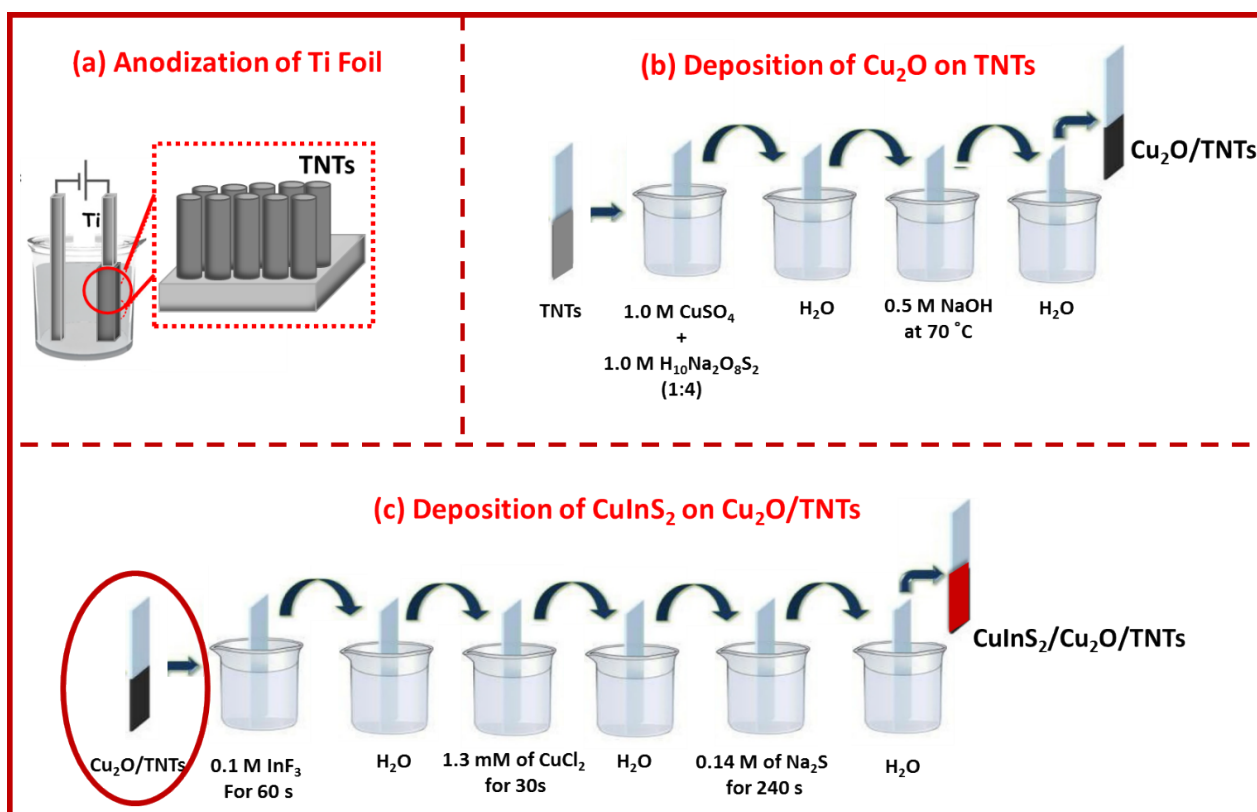


Figure S1. Different stages of fabrication of non-enzymatic biosensor

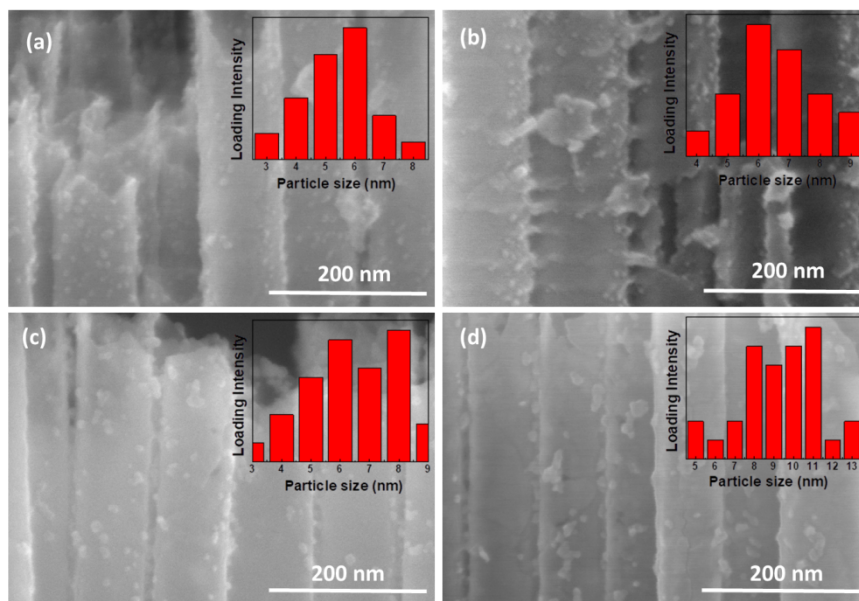


Figure S2: FE-SEM images showing the cross-sectional view of CuInS₂/Cu₂O/TNTs electrode for different decoration cycle of CuInS₂QDs for (a) 2 cycles, (b) 4 cycles, (c) 6 cycles, and (d) 8 cycles. The inset (a-d) shows their corresponding QDs size distribution.

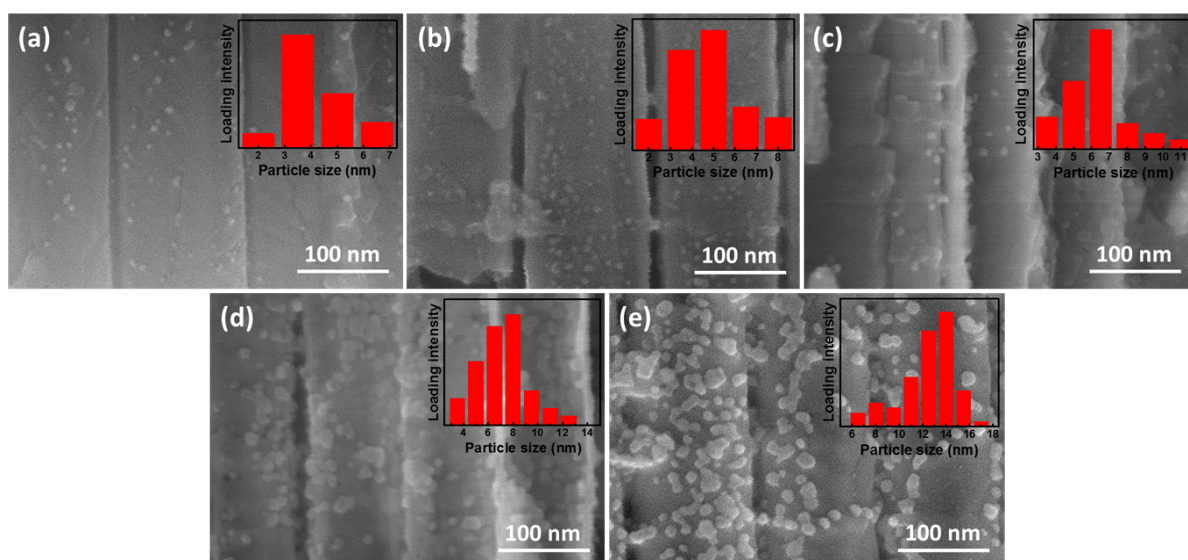
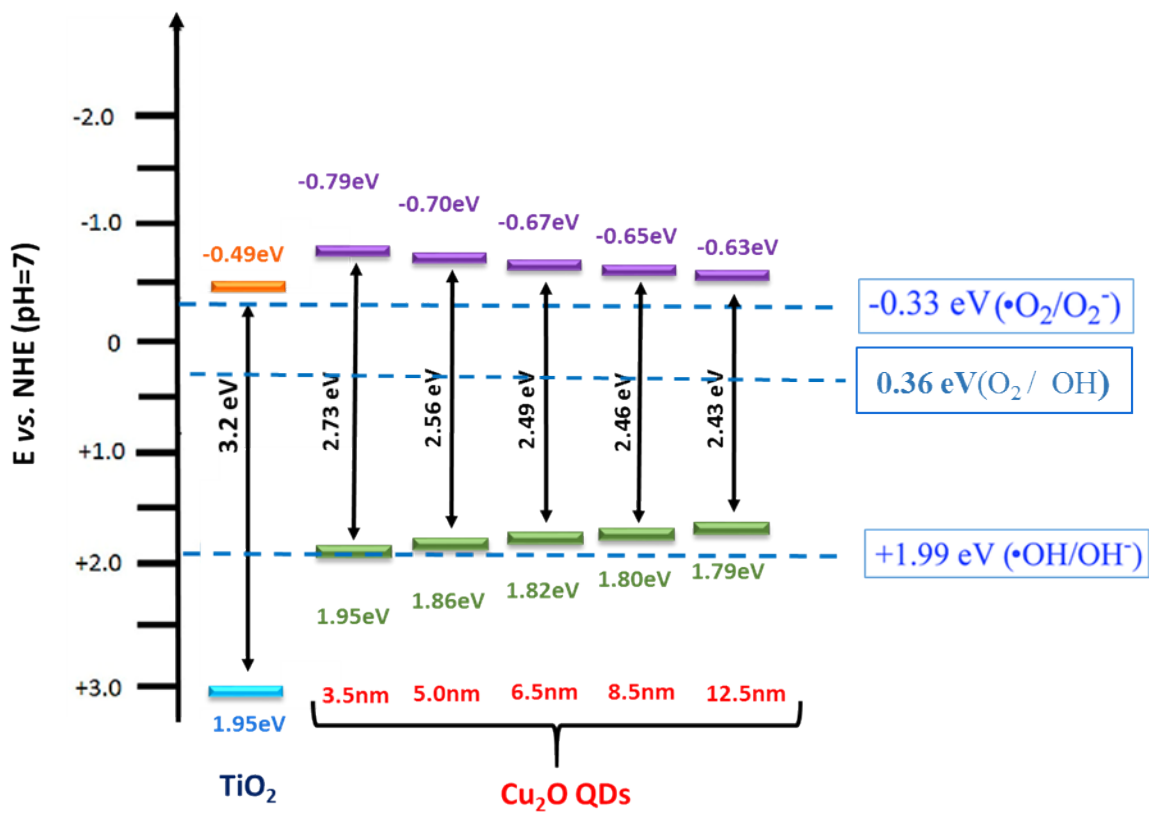
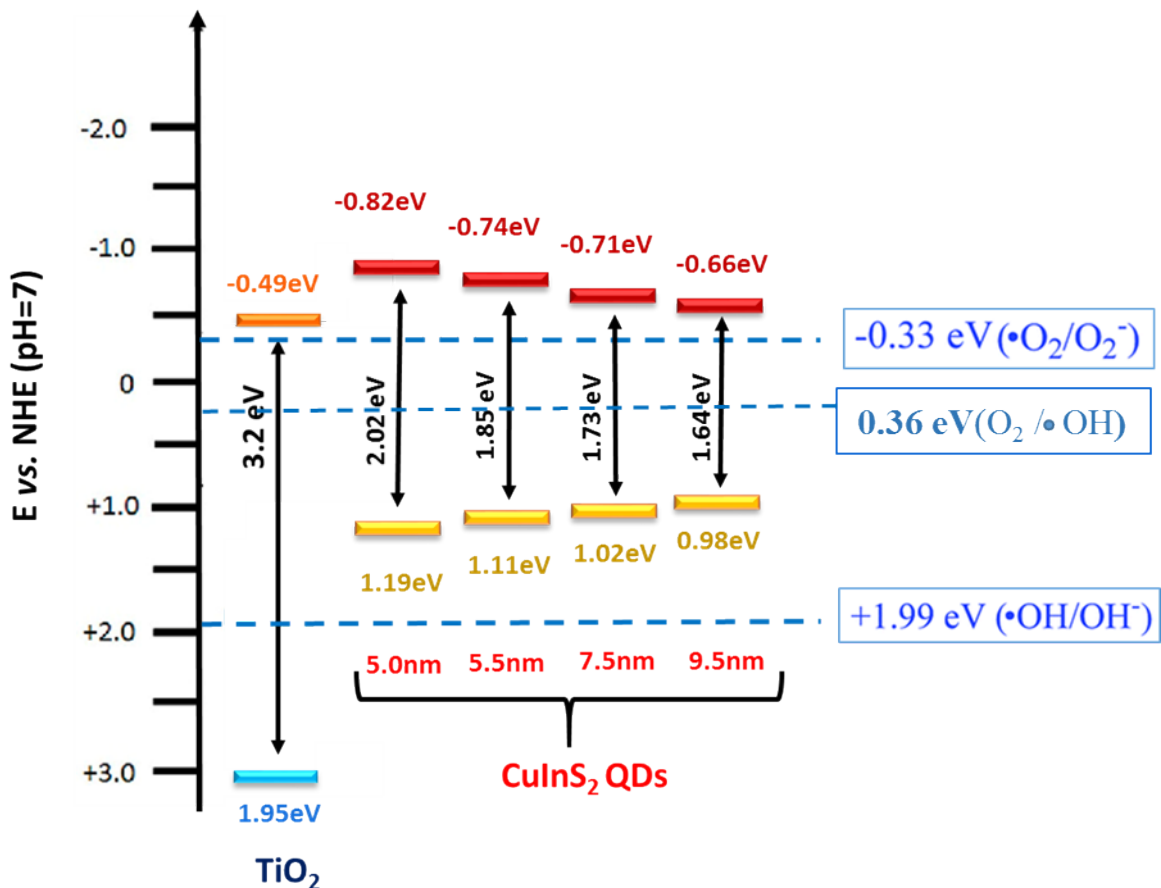


Figure S3. FE-SEM images showing the cross-sectional view of Cu₂O/TNTs electrode decorated with Cu₂O QDs for (a) 5 cycles, (b) 10 cycles, (c) 20 cycles, (d) 30 cycles, and (e) 40 cycles. The inset (a-e) shows their corresponding QDs size distribution.



Scheme S1: Variation of bandgaps of Cu₂O QDS with particle size.



Scheme S2: Variation of bandgaps of CuInS₂ QDs with particle size.

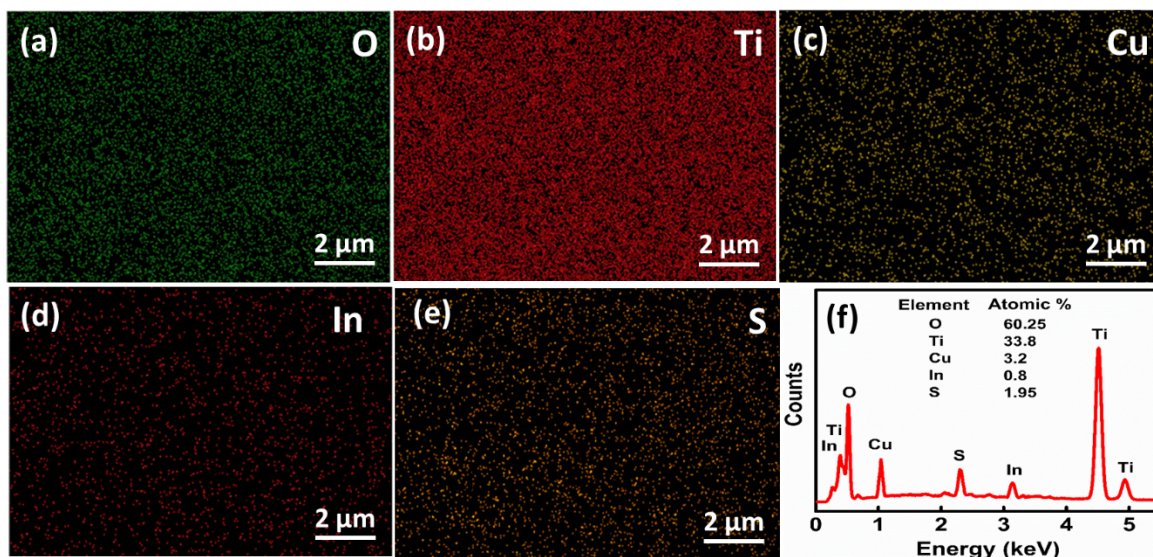


Figure S4. EDX elemental mapping of CuInS₂/Cu₂O/TNTs for (a) oxygen (O), (b) titanium (Ti), (c) copper (Cu), (d) indium (In), and (e) sulfur (S). (f) The corresponding EDX elemental spectra with atomic weight percent (%).

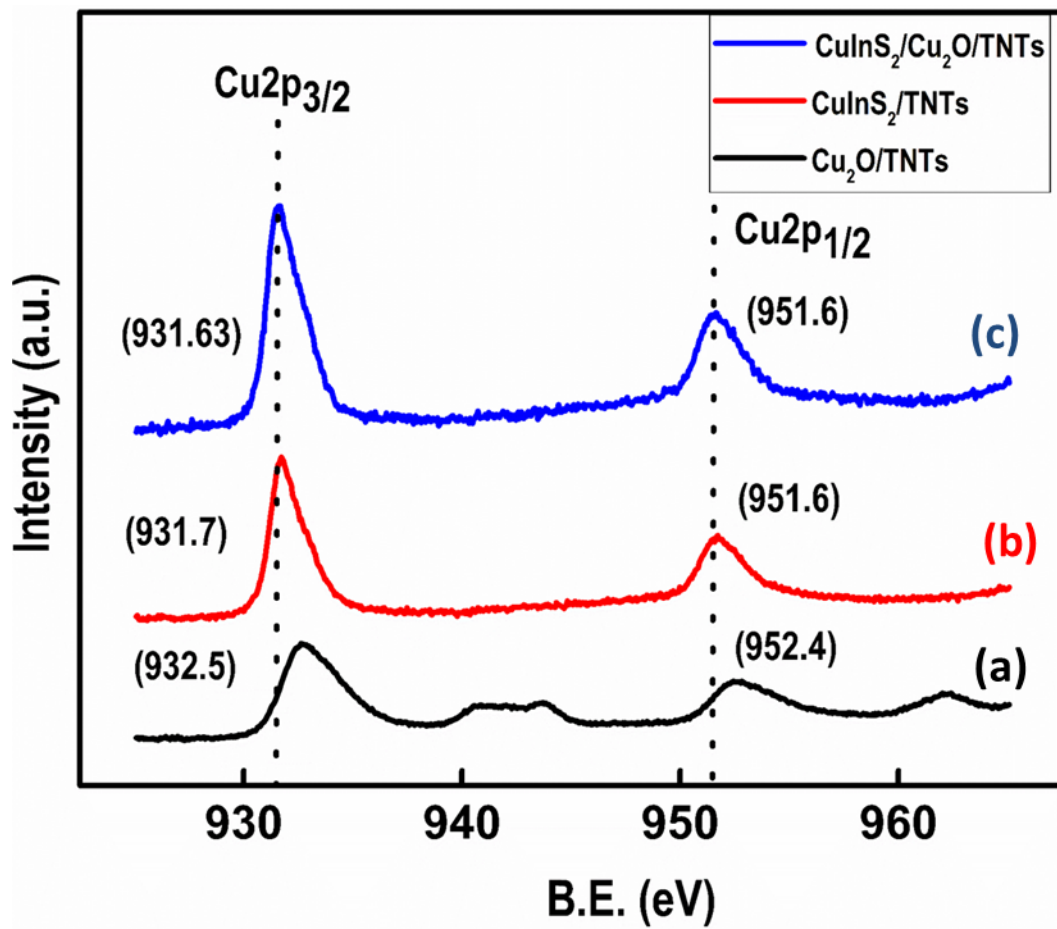


Figure S5: Comparison of high resolution XPS spectra of Cu₂p for (a) Cu₂O/TNTs, (b) CuInS₂/TNTs and (c) CuInS₂/Cu₂O/TNTs electrodes.

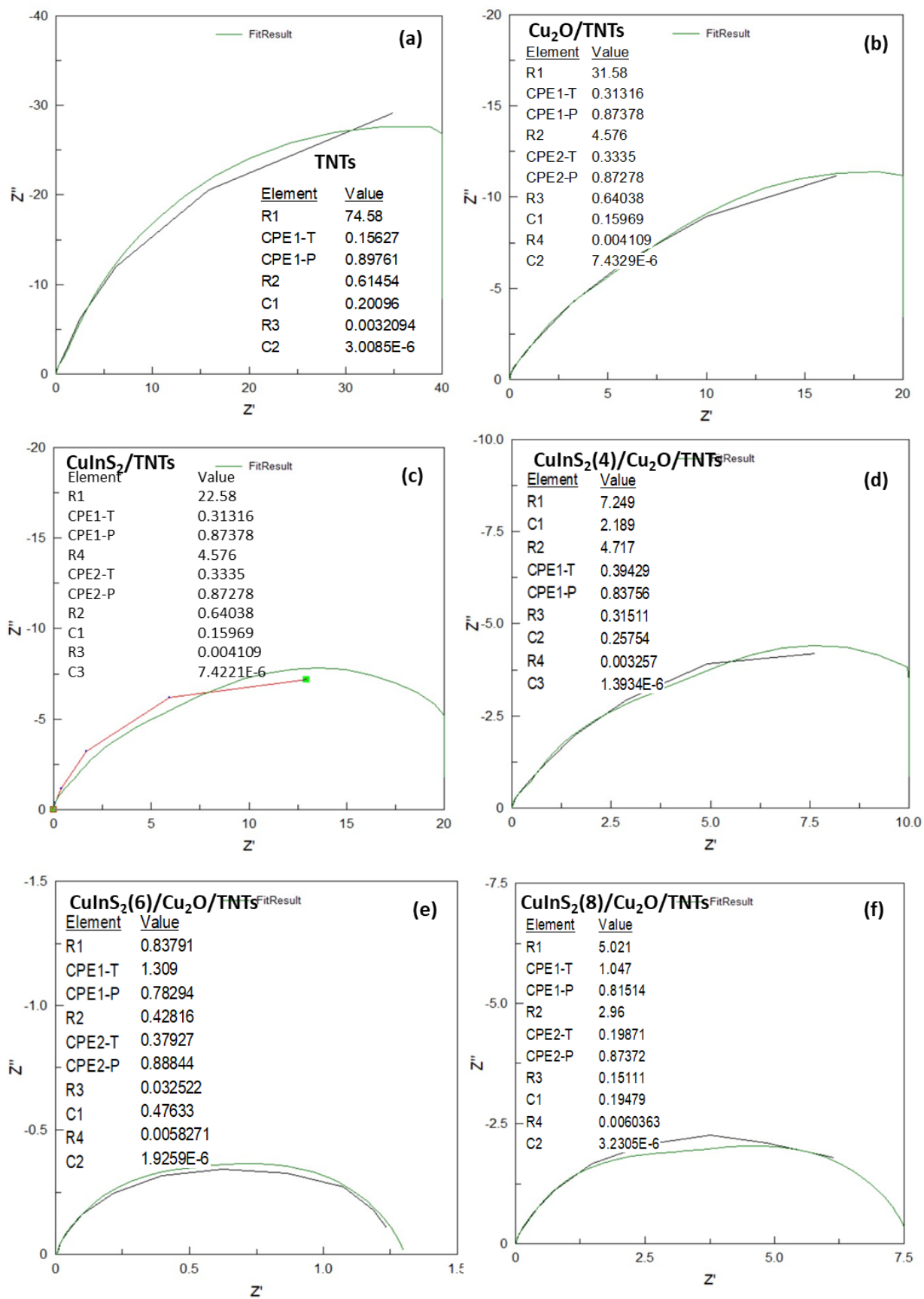


Figure S6: Fitted curves of EIS spectra and values of circuit parameters of (a) TNTs, (b) Cu₂O/TNTs, (c) CuInS₂/TNTs, (d) CuInS₂ (4)/Cu₂O/TNTs, (e) CuInS₂(6)/Cu₂O/TNTs, (f) CuInS₂(8)/Cu₂O/TNTs.

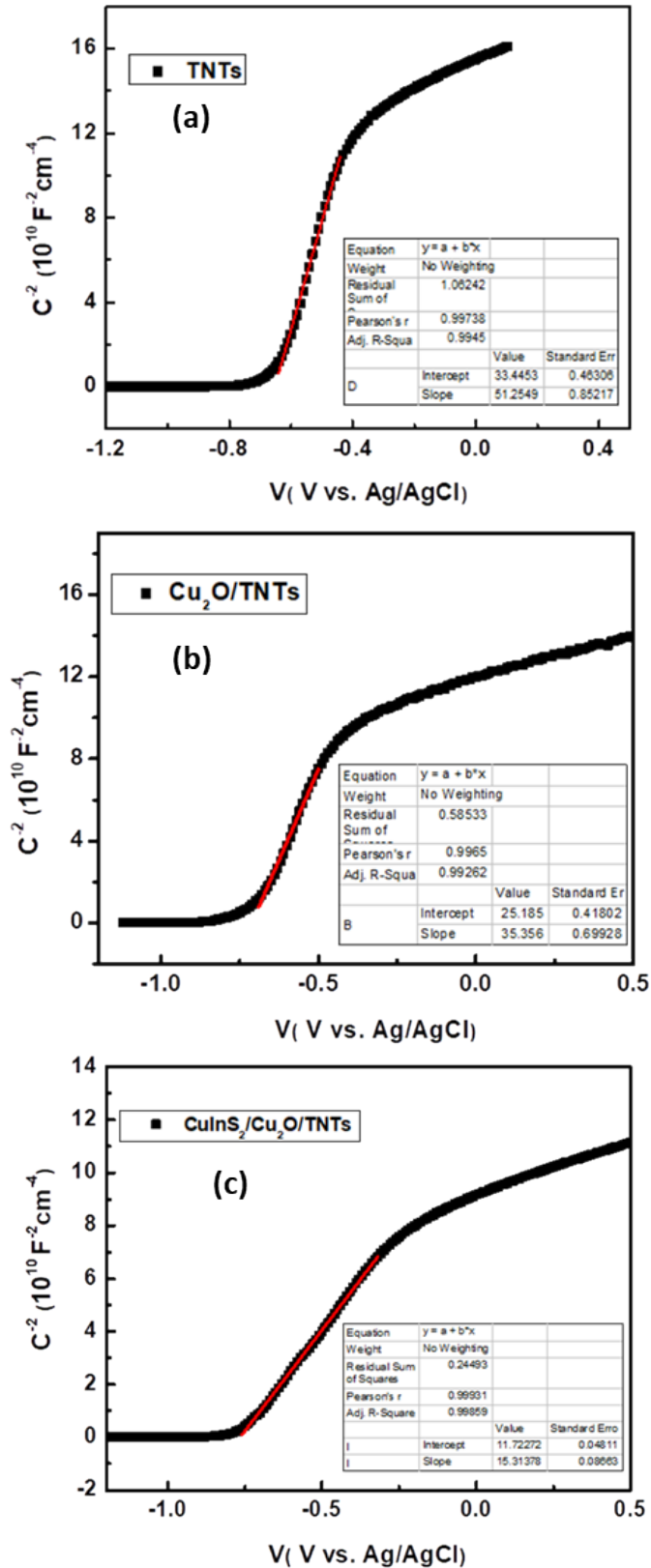


Figure S7: Fitting of the linear portion of the Mott-Schottky curves of (a) TNTs, (b) $\text{Cu}_2\text{O}/\text{TNTs}$, and (c) $\text{CuInS}_2/\text{Cu}_2\text{O}/\text{TNTs}$.

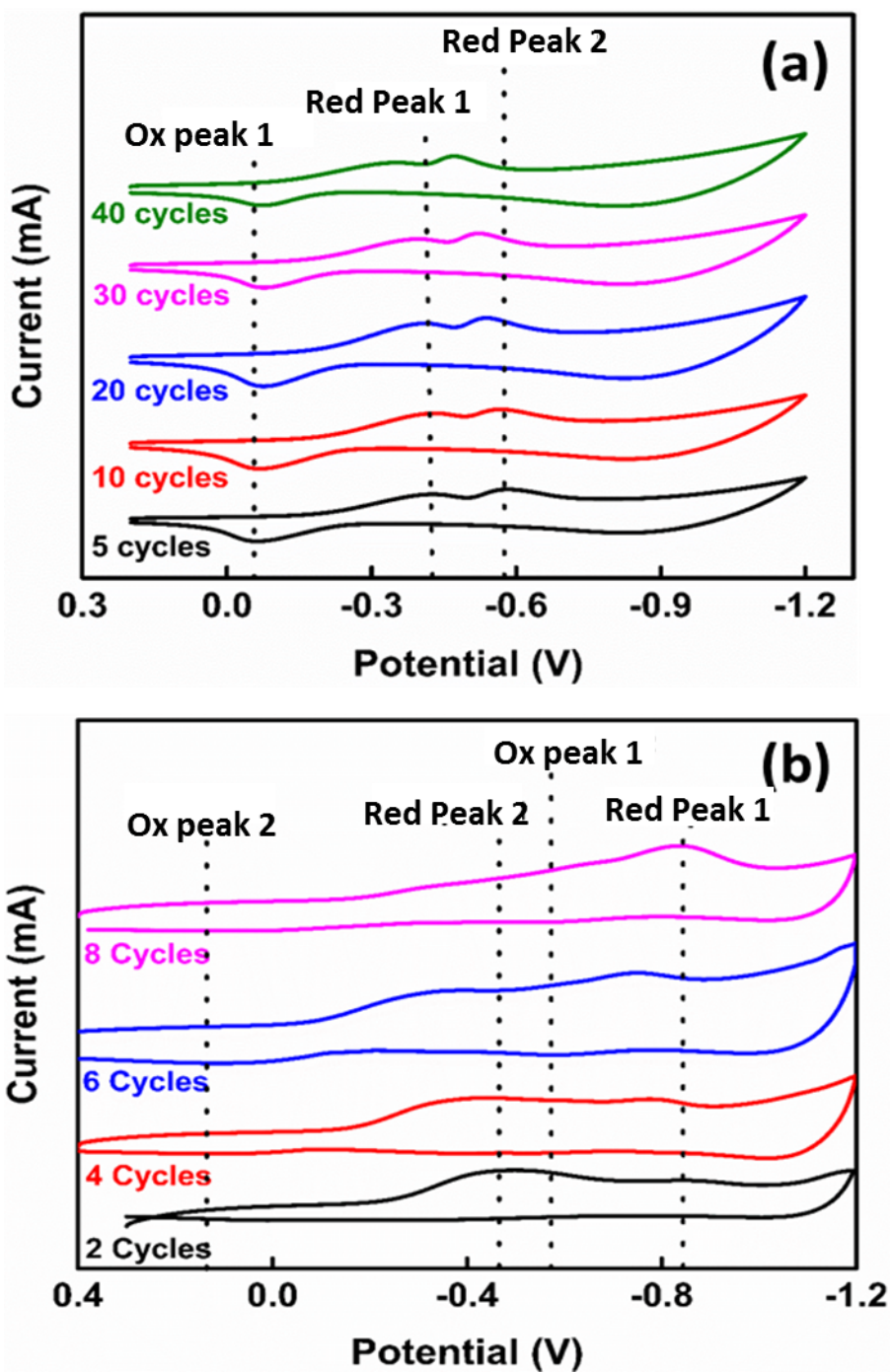


Figure S8: CV of (a) $\text{Cu}_2\text{O}/\text{TNTs}$ electrode for different deposition cycles of Cu_2O QDs on TNTs, and (b) $\text{CuInS}_2/\text{Cu}_2\text{O}/\text{TNTs}$ electrode for varying loading density of CuInS_2 QDs (by keeping the Cu_2O QDs deposition fixed to 10 cycles).

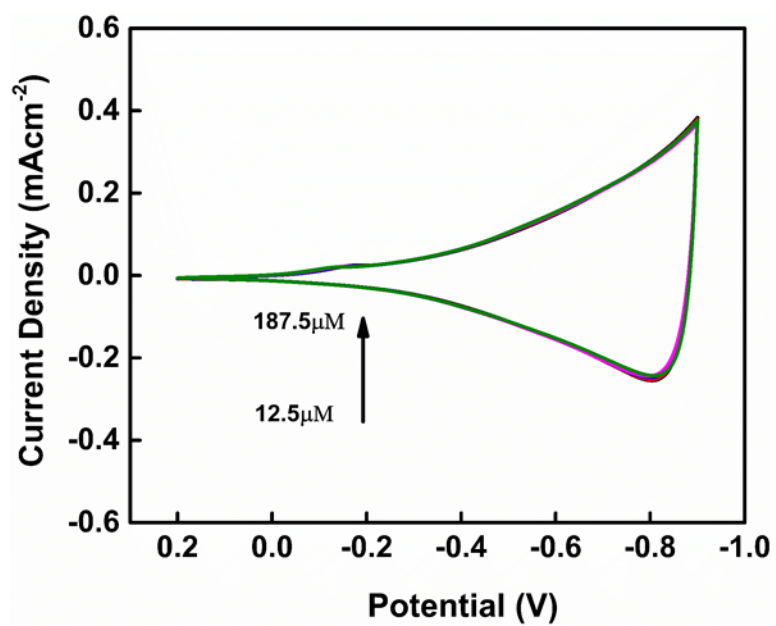


Figure S9: Cyclic voltammetry response studies of pristine TNTs as a function of cholesterol concentration.

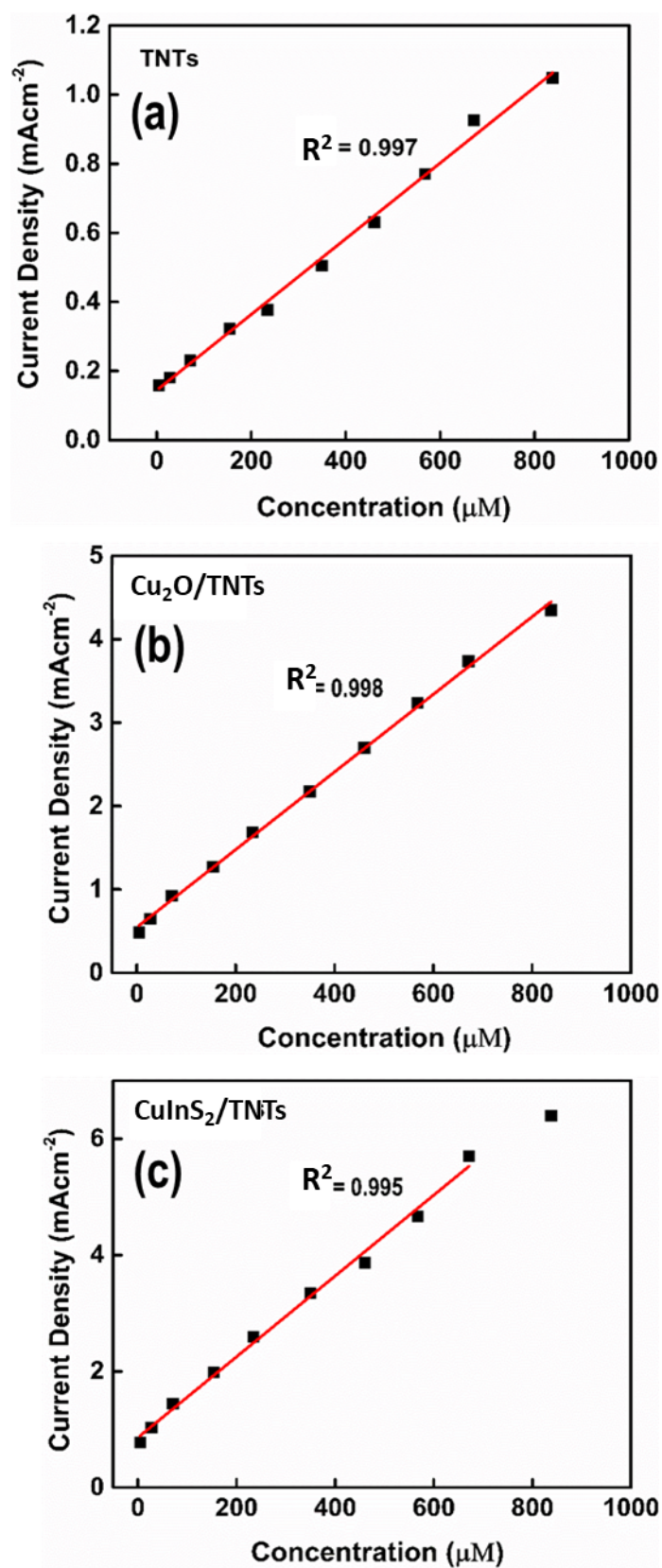


Figure S10. Linear fitting of the calibration curve of TNTs, Cu₂O/TNTs, and CuInS₂/TNTs electrode derived from their corresponding amperometric response for cholesterol detection.

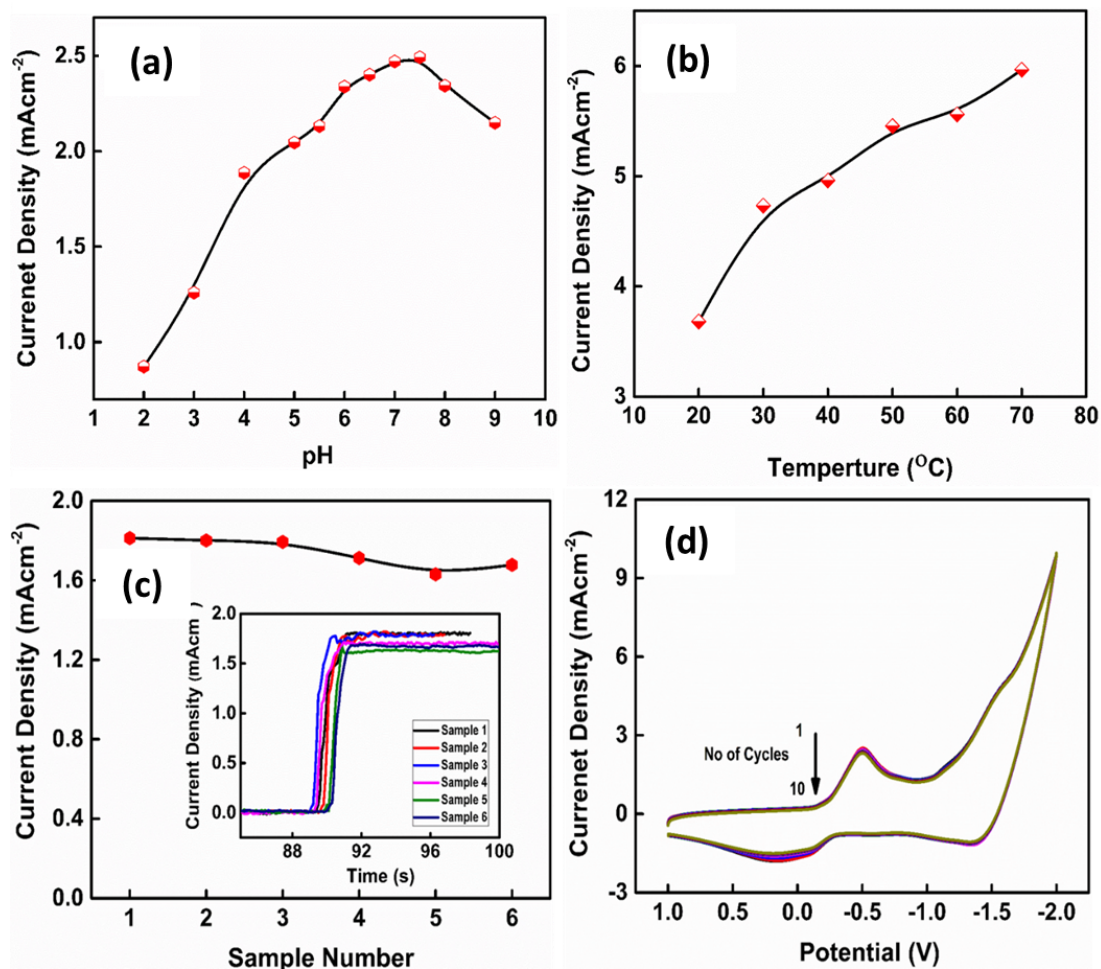


Figure S11. (a) Effect of pH, and (b) temperature of the electrolyte on current response of the CuInS₂/Cu₂O/TNTs electrode for cholesterol detection, (c) Calibration plot showing the reproducibility of CuInS₂/Cu₂O/TNTs electrode towards 0.25mM cholesterol for six individual samples (Sample1-Sample6). Inset shows the corresponding amperometric response, (d) CV of a single sample for 10 successive measurements.

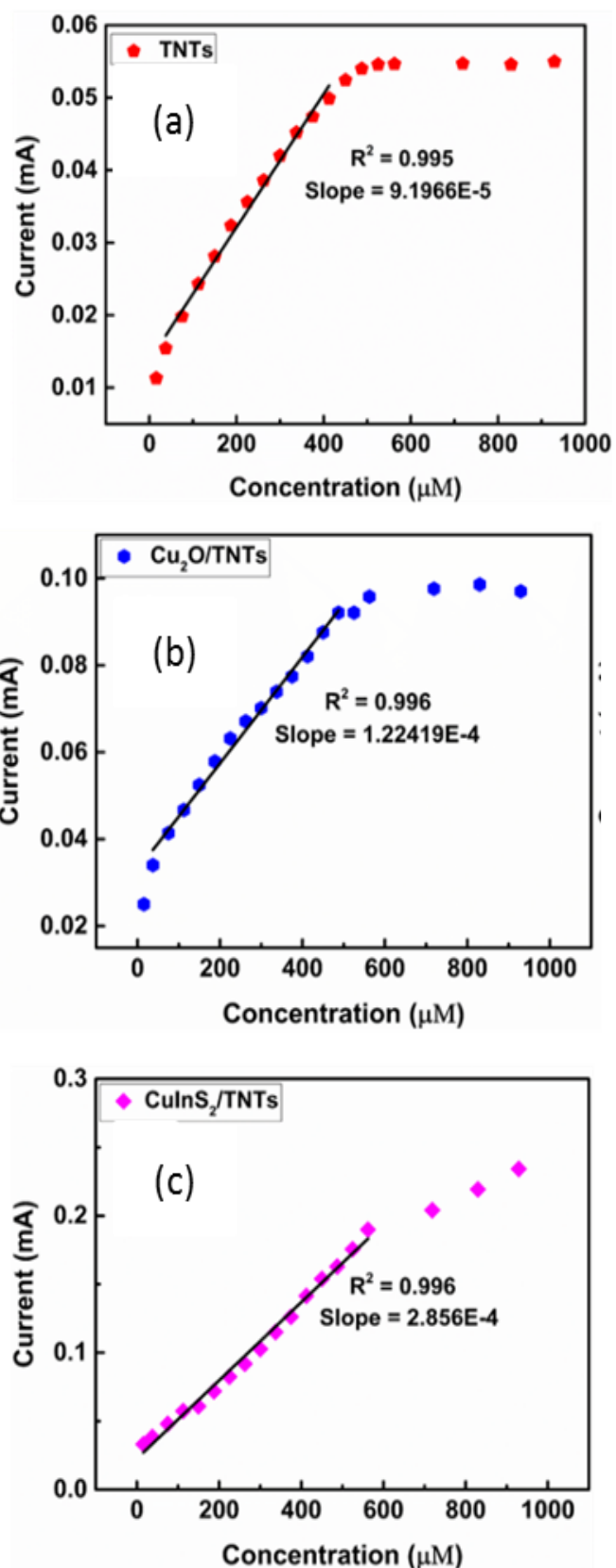


Figure S12: Linear fitting of the calibration curve of (a) TNTs, (b) $Cu_2O/TNTs$, and (c) $CuInS_2/TNTs$ derived from their corresponding amperometric response for ibuprofen detection.

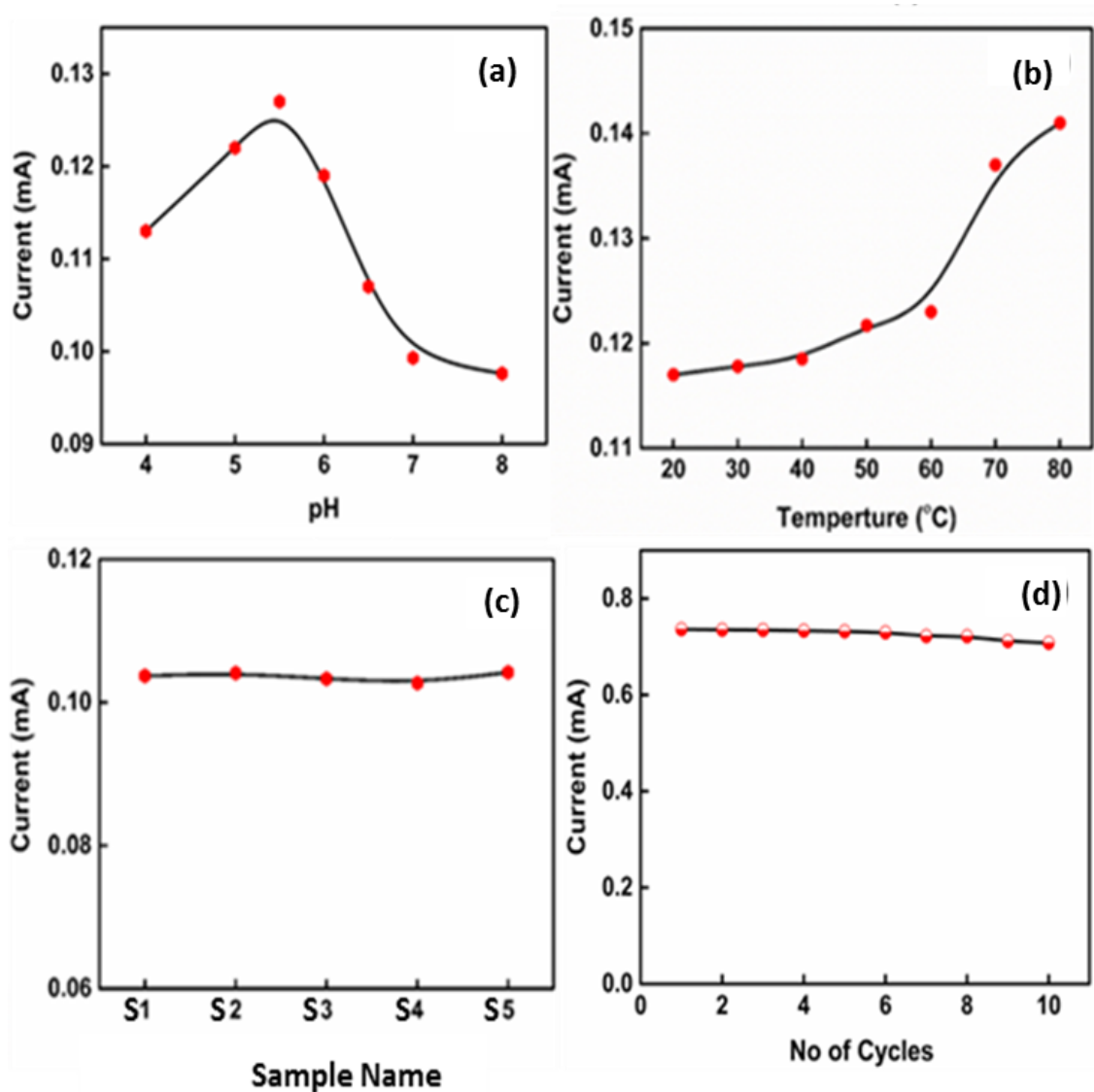


Figure S13: (a) Effect of pH, and (b) temperature of the electrolyte on the current response of CuInS₂/Cu₂O/TNTs for ibuprofen detection. Calibration plot showing the (c) reproducibility and (d) repeatability of CuInS₂/Cu₂O/TNTs towards 99.4 μM ibuprofen.

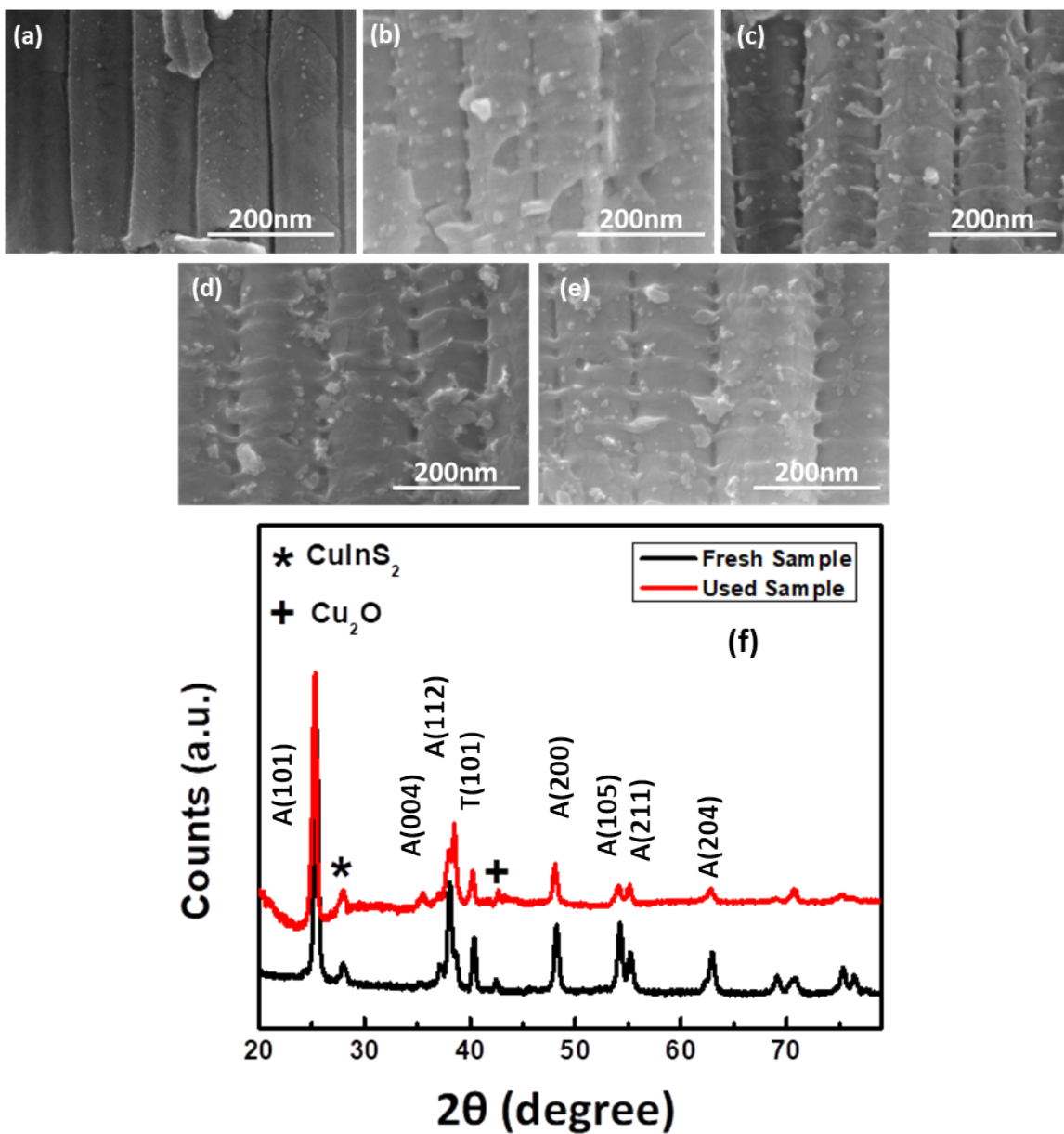


Figure S14: FE-SEM cross sectional images of used (a) Cu₂O/TNTs, (b) CuInS₂/TNTs, (c) CuInS₂ (4)/Cu₂O/TNTs, (d) CuInS₂(6)/Cu₂O/TNTs, and (e) CuInS₂(8)/Cu₂O/TNTs. (f) Comparison between the XRD pattern of fresh and used CuInS₂/Cu₂O/TNTs samples.