Electronic Supporting Information

A Capacitive DNA Sensor for Sensitive Detection of *Escherichia coli* O157:H7 in Potable Water Based on *z3276* Genetic Marker: Fabrication and Analytical Performance

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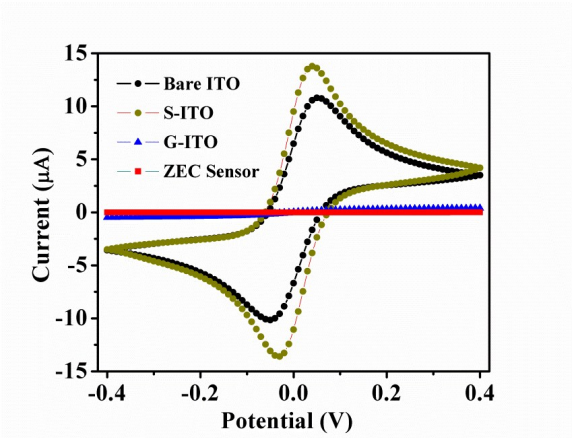
This Supporting Information provides the following information.

Figure S1. Cyclic voltammograms for ZEC sensor chip at different stages of sensor preparation in 10mM PBS with 1mM $[Fe(CN)_6]^{3-/4-}$.



CV analysis: The redox peaks for S-ITO chip observed were ascribed to the $-NH_2$ groups of APTES.[1] However, the current was further found to decrease for G-ITO and ZEC sensor chip and can be attributed to successful blocking by GA linker and DNA probe immobilization. This continuous decrease in current response and disappearance of peaks of redox couple clearly revealed the insulating nature of the ZEC sensor chip, thus, indicating its suitability for the development of a capacitance-based DNA biosensor for capacitive measurements.

Figure S2. Characterization of the fabricated electrodes for the development of ZEC sensor chip based on the admittance analysis. Real and imaginary spectra of admittance for Bare ITO (**A**); S-ITO (**B**); G-ITO (**C**); and ZEC sensor chip (**D**) using PBS in frequency range of 10^{-1} to 10^{5} Hz.

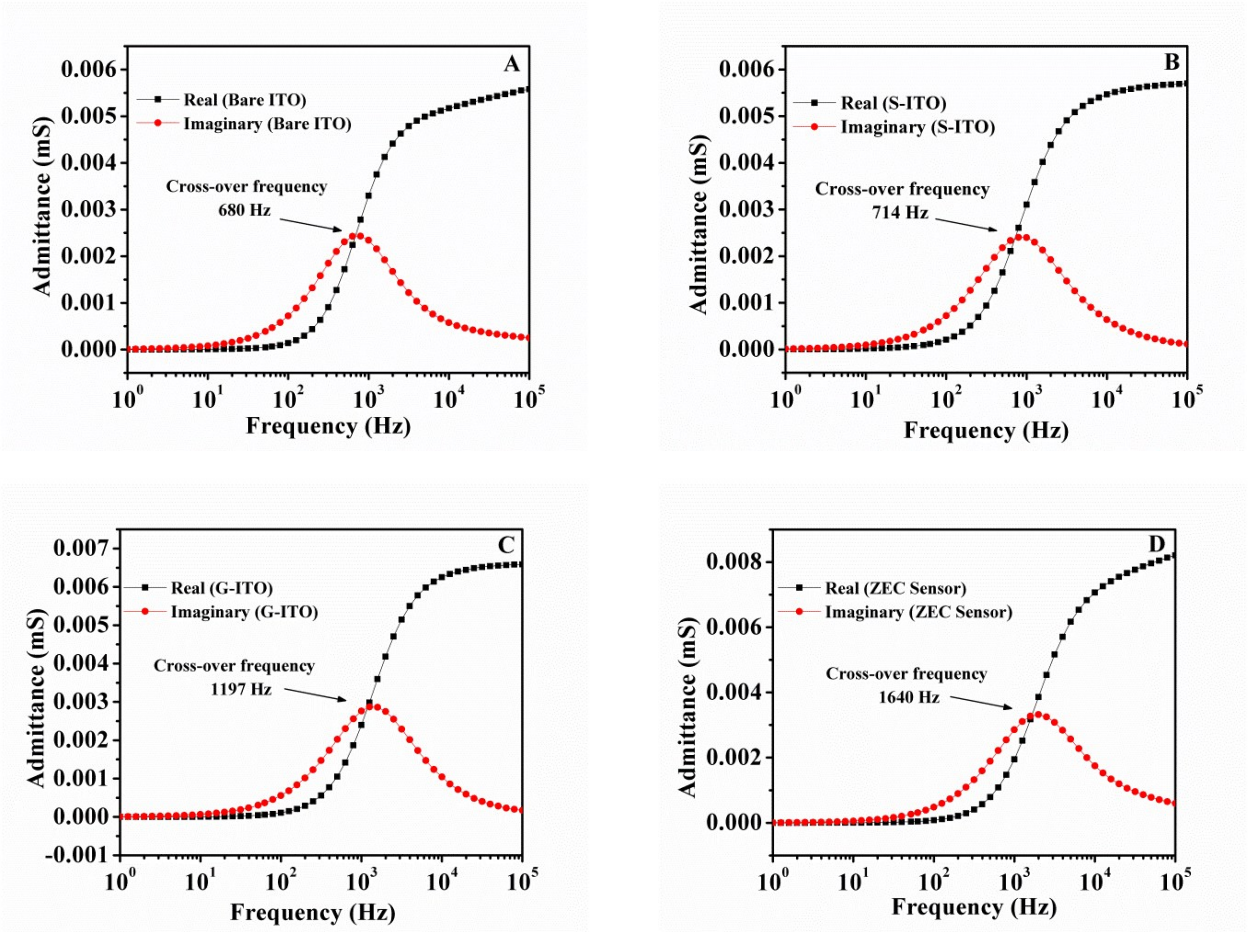
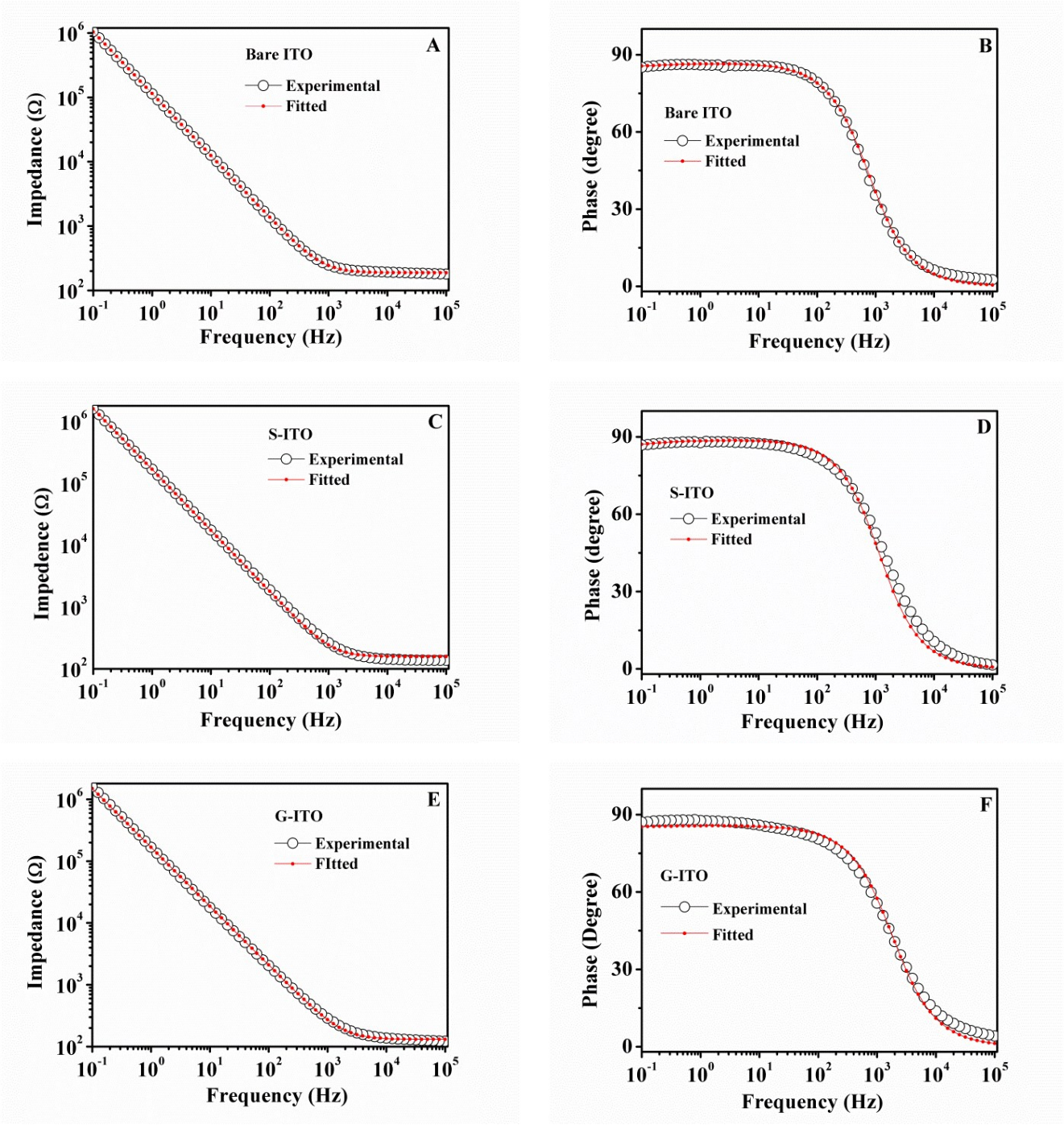


Figure S3. Circuit fitting plots of the equivalent circuit employed in EIS studies. Circuit fitting plots of impedance measurement for Bare ITO (**A**), S-ITO (**C**), G-ITO (**E**), ZEC sensor chip (**G**), and ZEC sensor chip hybridized with DNA (**I**). Circuit fitting plots of phase angle for Bare ITO (**B**), S-ITO (**D**), G-ITO (**F**), ZEC Sensor chip (**H**), and ZEC sensor chip hybridized with DNA (**J**).



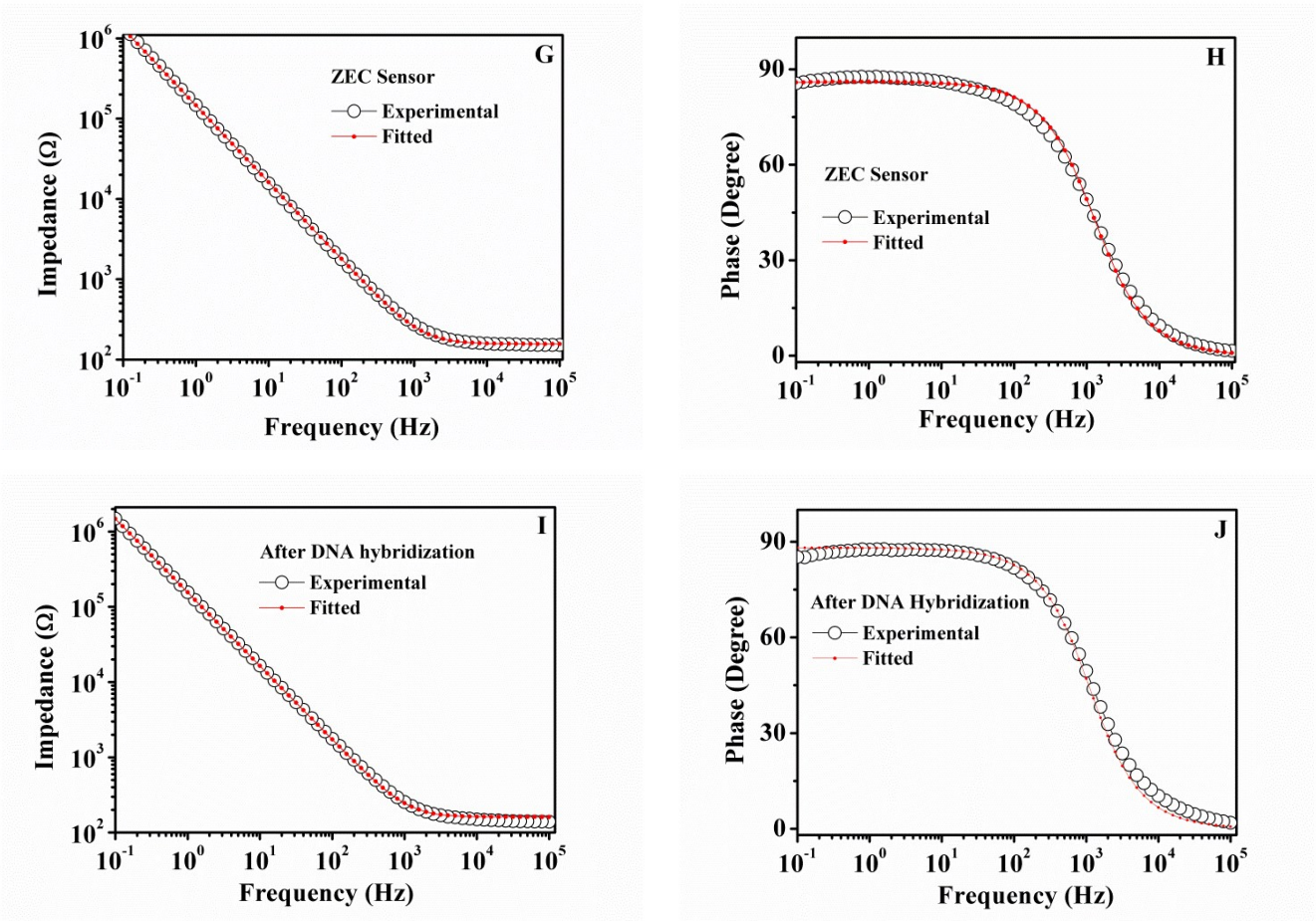


Table S1. Characterization of ZEC sensor chip for detection *E. coli* O157:H7 ATCC 43895 at each stage of fabrication using AFM.

Characteristics	Average height (nm)	Average roughness (nm)	Root mean square (nm)
Bare ITO	6.29573	1.40293	1.77967
S-ITO	5.04933	0.268538	0.34205
G-ITO	5.36949	0.838522	1.25767
ZEC Sensor	7.03131	1.27435	1.78044
After hybridization with DNA	9.02396	2.04096	2.88125

Figure S5. Characterization of surface topographies of ZEC sensor chip using SEM. SEM images for Bare ITO chip surface (**A**); ZEC sensor chip surface before (**B**); and after hybridization with DNA (**C**). An arrow head shows the unhybridized region on ZEC sensor chip surface (**C**).

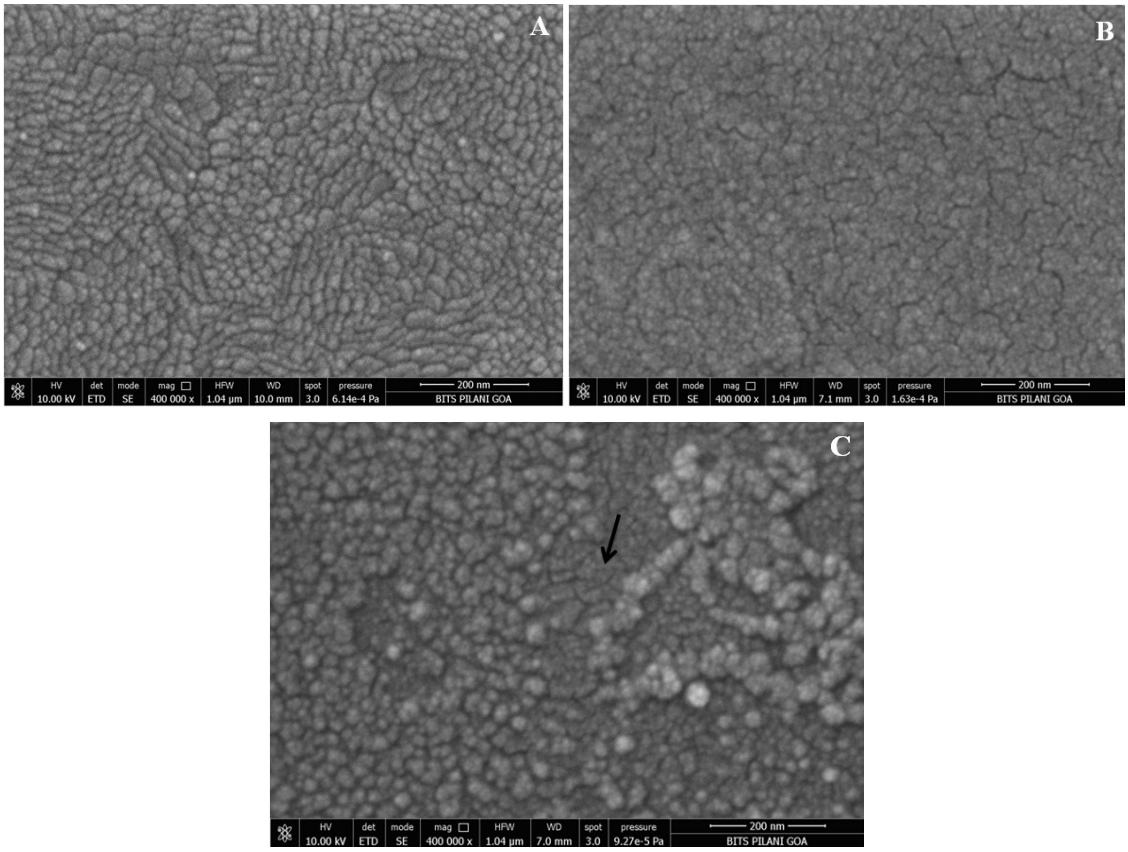


Figure S6. Relative permittivity variation plots (**A**) and relative permittivity calibration curve (**B**) for 0.1, 0.5, 1, 5, 10 and 25 pg/10mL analyte concentrations recorded in PBS using EIS.

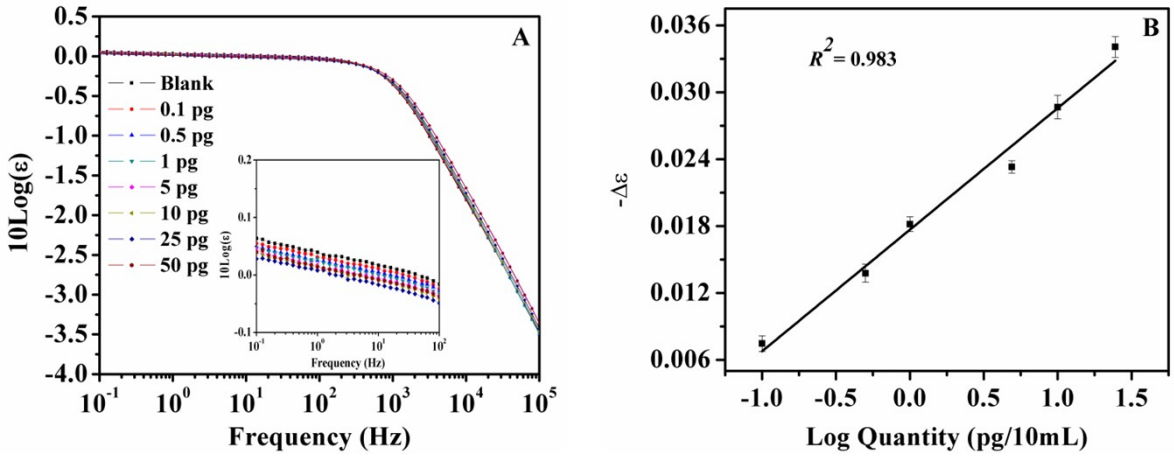


Table S2. Comparison of linear ranges and detection limits of different biosensors for detection of *E. coli* O157:H7.

Modified material of electrode	Detection technique	Linear range	Detection limit	Reference
1,6-Hexanedithiol/AuNPs	Quartz Crystal Microbalance	-	DNA equivalent to 2×10^3 CFU/mL	Wang et al.[2]
Antibody/ITO	EIS	6×10^4-6×10^7 cells/mL	6×10^3 cells/mL	Ruan et al.[3]
GIOCh/ITO	EIS	10^{-6}-10^{-14} M	1×10^{-14} M	Tiwari et al.[4]
GO/CS	EIS	1.0×10^{-14}-1.0×10^{-8} M	3.584×10^{-15} M	Xu et al. [5]
AuNPs/graphene oxide-modified paper electrode	EIS	1.5×10^2-1.5×10^7 CFU/mL	150 CFU/mL	Wang et al.[6]
AuNPs/MUA and UDT	EIS	-	100 CFU/mL	Wan et al.[7]
AuNPs/thiolated protein G/Ab	EIS	10^0-10^3 CFU/mL	48 CFU/mL	Lin et al.[8]
ZEC sensor chip	Capacitance	0.5-25pg/10mL	DNA equivalent to 13.67 CFU/10mL	**This study**

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