

Electrochemical Impedance Spectroscopy Characterization of Electron Transport and Recombination in ZnO Nanorod Dye-Sensitized Solar Cells

Chuan He^{,†‡}, Zhi Zheng^{*,‡}, Huili Tang[‡], Linan Zhao[‡], and Fang Lu[†]*

Surface Physics Laboratory, Laboratory of Advanced Materials, Fudan University,

Shanghai 200433, People's Republic of China and Research and Technology

Laboratory, Honeywell Integrated Technology (China) Co., 430 Libing Rd, Shanghai

201203, People's Republic of China

* To whom correspondence should be addressed. E-mail: 072019019@fudan.edu.cn,
zhi.zheng@honeywell.com.

[†] Fudan University

[‡] Honeywell Integrated Technology (China) Co.

Supplemental Figures:

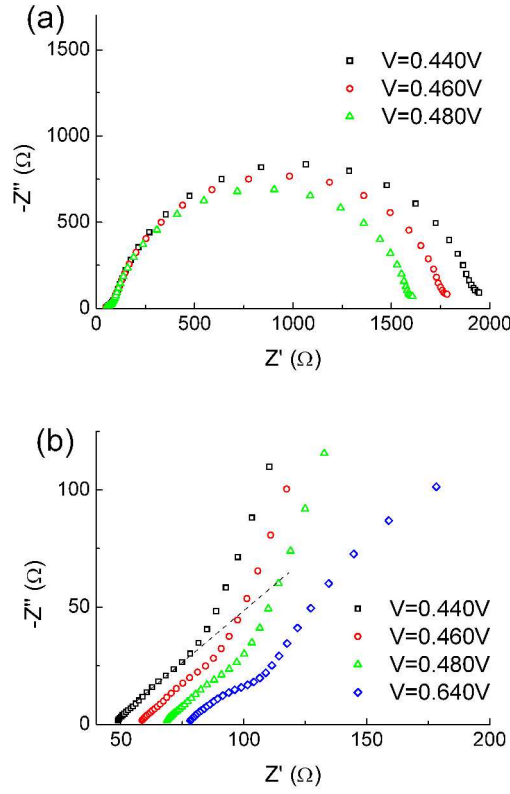


Figure S1. (a) Impedance spectra of the sample measured under 14.85 mW/cm^2 monochromatic illumination at 0.440V (black square), 0.460V (red circle) and 0.480V (green triangle). (b) High frequency region of (a) together with the 0.640V impedance (blue diamond). The spectra in (b) have been displaced along the real axis in the same way as in Figure 3b.

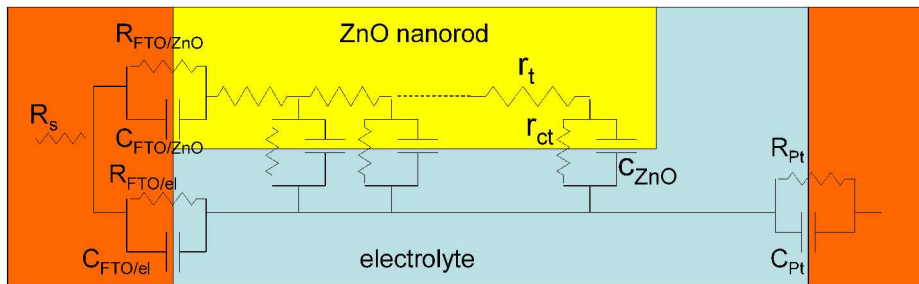


Figure S2. The transmission line model used to fit the impedance spectra in this work.

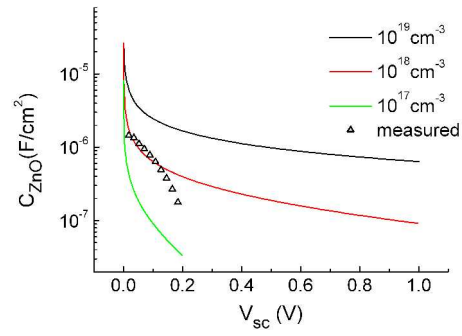


Figure S3. Measured capacitance per unit area of the nanorod surface (corrected from the linear background) and the modeled capacitance corresponding to concentrations of 10^{19}cm^{-3} (black line), 10^{18}cm^{-3} (red line) and 10^{17}cm^{-3} (green line) versus potential drop across the space charge region. The flat band potential has been assumed to be 0.650V.

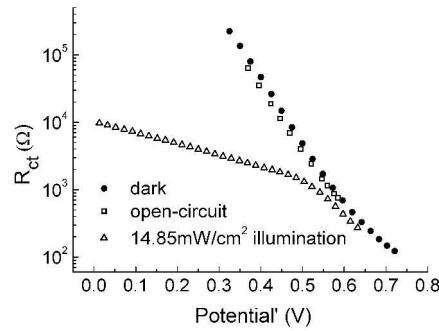


Figure S4. R_{ct} measured at a series of open-circuit conditions (open square). R_{ct} in the dark and under 14.85mW/cm^2 monochromatic illumination that has been shown in Figure 4b is also shown here for comparison.

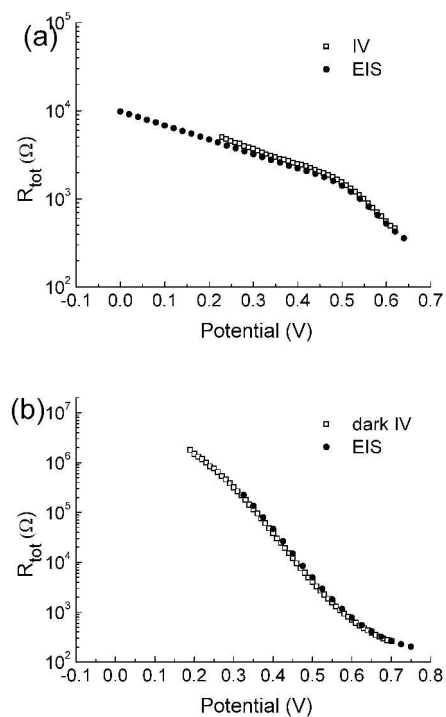


Figure S5. Comparison of the total resistance of the cell obtained from the *IV* characteristics (open square) and from EIS (solid circle): (a) under 14.85 mW/cm² monochromatic illumination and (b) in the dark. At low potentials, the derivative of the *IV* curves frequently shows abrupt change and is omitted. (Smoothing of the *IV* curves was not used when taking the derivative.)