

Supporting Information for:

**Quantifying Charge Carrier Dynamics in Fullerene-Sensitized ZnO Nanorod
Array Photoanodes for Enhanced Photoelectrochemical Water Splitting**

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1. Peak's intensities extracted from XRD diffractogram pattern.

Table S1. Peaks intensities for crystal facet of ZnO including 2θ values.

Sample Name	2θ (°)			Intensities		
	(100)	(002)	(101)	(100)	(002)	(101)
0.05 M ZnO	31.93	34.54	-	41.9735	46.0133	-
0.5 M ZnO	31.78	34.48	36.25	43.9934	50.9005	42.9735
1.5 M ZnO	31.81	34.39	36.25	65.9668	75.0265	78.0066
0.05 M ZnO/PCBM	-	34.54	-	-	96.9337	-
0.5 M ZnO/PCBM	31.84	34.39	36.19	52.9649	37.0398	51.9934
1.5 M ZnO/PCBM	31.84	34.46	36.28	66.9337	64.0066	81.9934

Table S2. Intensity of peaks for ITO substrate, symbolised by an asterisk (*) in Figure 1

2θ (°)	Intensities
21.43	77.9337
30.37	222.9403
35.35	172.9649
50.71	97.9867
60.34	86.9403

2. XPS signals for C 1s.

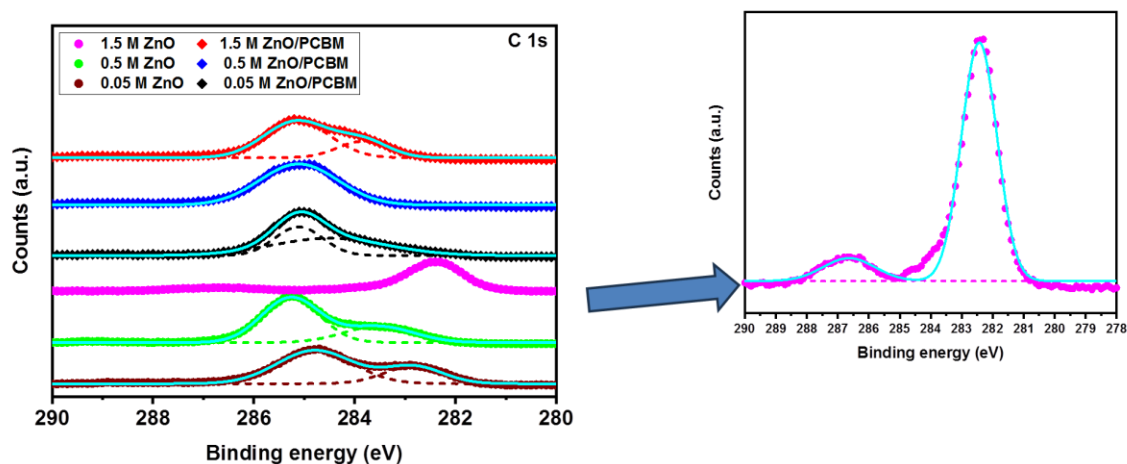


Figure S1. XPS C 1s spectrum for each photoanode before correction with a value of 284.8 eV. The right side is the magnification of C 1s for ZnO synthesised with 1.5 M ZnO seed layer precursor concentration.

Table S3. Binding Energy Peak Extraction from C 1s XPS spectrum for adventitious carbon (C-C) before correction with a value of 284.8 eV.

Sample Name	Binding Energy's Peak of C-C (eV)
0.05 M ZnO Pristine	283.0
0.5 M ZnO Pristine	283.2
1.5 M ZnO Pristine	282.3
0.05 M ZnO/PCBM	283.6
0.5 M ZnO/PCBM	284.9
1.5 M ZnO/PCBM	285.2

3. Shifting peak of Zn 2p_{3/2}, O₁, and O₂ in XPS spectra.

Table S4. Extracted Binding Energy's Peak from Zn 2p_{3/2} XPS spectra.

Sample Name	Binding Energy's Peak Zn 2p_{3/2} (eV)
0.05 M ZnO Pristine	1023.7
0.5 M ZnO Pristine	1023.7
1.5 M ZnO Pristine	1021.5
0.05 M ZnO/PCBM	1023.3
0.5 M ZnO/PCBM	1022.2
1.5 M ZnO/PCBM	1021.5

Table S5. Extracted Binding Energy's Peak from O 1s XPS spectra.

Sample Name	Binding Energy's Peak O₁ (eV)	Binding Energy's Peak O₂ (eV)
0.05 M ZnO Pristine	533.9	532.2
0.5 M ZnO Pristine	533.0	531.7
1.5 M ZnO Pristine	531.6	530.1
0.05 M ZnO/PCBM	532.4	531.4
0.5 M ZnO/PCBM	532.1	530.7
1.5 M ZnO/PCBM	531.2	530.1

4. EIS Nyquist Plots for pristine ZnO at 0.7 V vs. Ag/AgCl

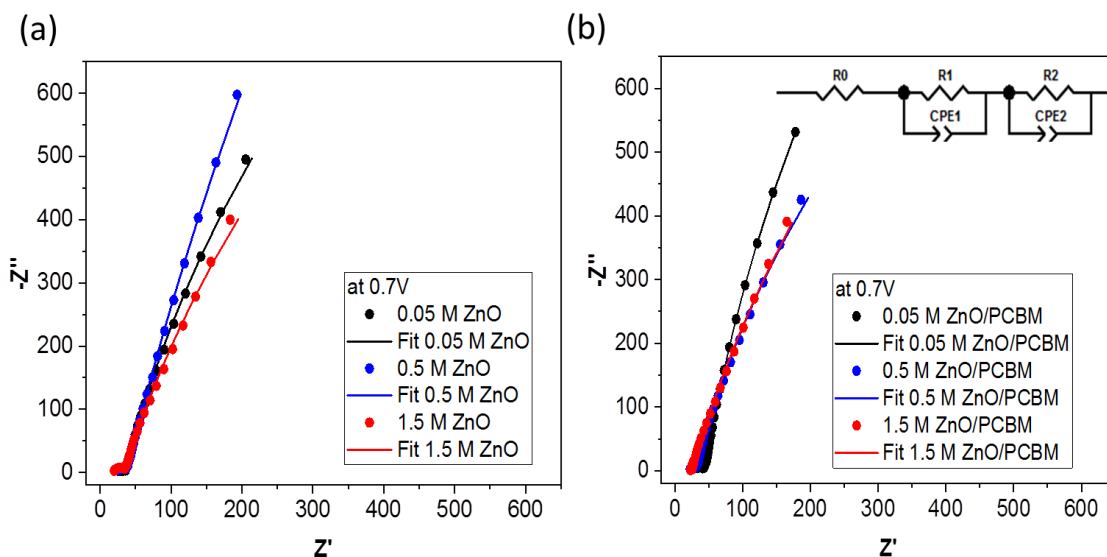


Figure S2. EIS Nyquist Plots at at 0.7 V vs. Ag/AgCl for pristine ZnO (a) and for ZnO/PCBM (b), respectively. The ECM used for modeling Figures 7(a) and (b) is shown inside the graph in Figure 7(b).

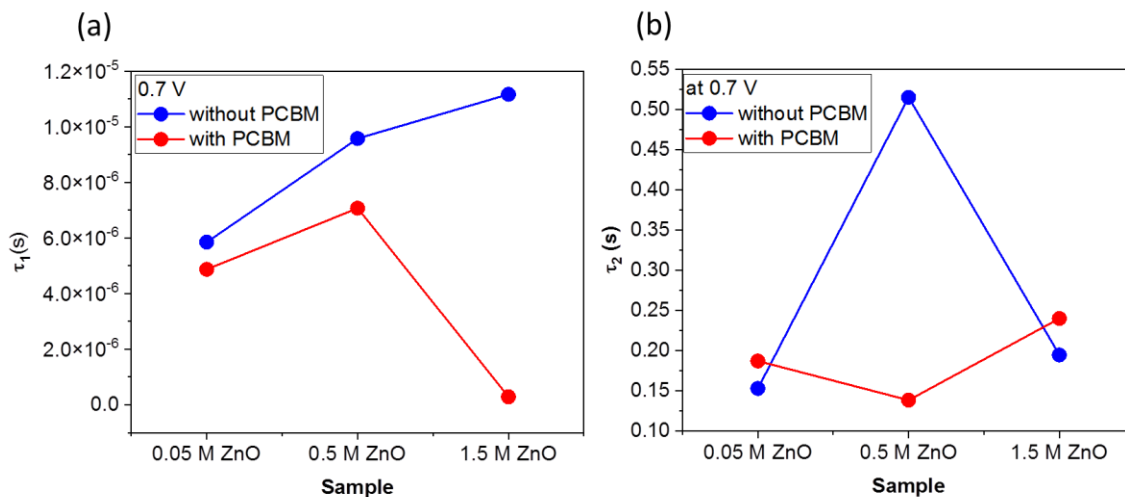


Figure S3. Time constants τ_1 and τ_2 as a function of specific ZnO seed layer precursor concentrations for pristine ZnO and ZnO/PCBM at at 0.7 V vs. Ag/AgCl, respectively.

Table S6. Extracted EIS parameters (aat 0.7 V vs. Ag/AgCl) from the ECM of pristine ZnO and ZnO/PCBM at specific ZnO seed layer precursor concentration.

Sample Name	R_0 (Ω)	R_1 (Ω)	Q_1 (F)	α_1	τ_1 (s)	R_2 (Ω)	Q_2 (F)	α_2	τ_2 (s)
0.05 M ZnO	27.65	8.414	4.2293×10^{-5}	0.65904	5.84846×10^{-6}	3896	$5.057_5 \times 10^{-7}$	0.86571	0.15314
0.05 M ZnO /PCBM	26.19	19.29	3.9599×10^{-5}	0.58673	4.87005×10^{-6}	5285	4.12×10^{-5}	0.91003	0.18728
0.5 M ZnO	23.28	13.96	7.2332×10^{-6}	0.79615	9.57451×10^{-6}	12533	$4.4983_5 \times 10^{-7}$	0.8637	0.51502
0.5 M ZnO /PCBM	19.61	11.81	2.1309×10^{-5}	0.69879	7.0697×10^{-6}	3075	5.9626×10^{-5}	0.85854	0.13864
1.5 M ZnO	18.87	15.08	2.6728×10^{-6}	0.88743	1.11663×10^{-5}	3600	7.1322×10^{-5}	0.83096	0.19472
1.5 M ZnO /PCBM	19	5	2.383×10^{-5}	0.6	2.88507×10^{-7}	4092	$7.4802_5 \times 10^{-7}$	0.82987	0.24013