Supporting Information

Solar-Assisted All-Solid Supercapacitors by Composite Nanostructure of ZnO Nanowires with GO and rGO

Cigdem Tuc Altaf,[a] Arpad Mihai Rostas,[b] Maria Mihet,[b] Mihaela Diana Lazar,[b] Igor Iatsunskyi,[c] Emerson Coy,[c] Emre Erdem,[d] Mehmet Sankir,[a] Nurdan Demirci Sankir,[a]

[a] Department of Materials Science and Nanotechnology Engineering, TOBB University of Economics and Technology, Sogutozu Caddesi No 43 Sogutozu 06560 Ankara, Turkey

[b] National Institute for Research and Development of Isotopic and Molecular Technologies- INCDTIM, 67-103 Donat, 400293 Cluj-Napoca, Romania

[c] NanoBioMedical Centre, Adam Mickiewicz University in Poznań, Wszechnicy Piastowskiej 3, 61-614, Poznań, Poland

[d] Faculty of Engineering and Natural Sciences, Sabanci University, Orhanli, Tuzla, 34956, Istanbul, Turkey

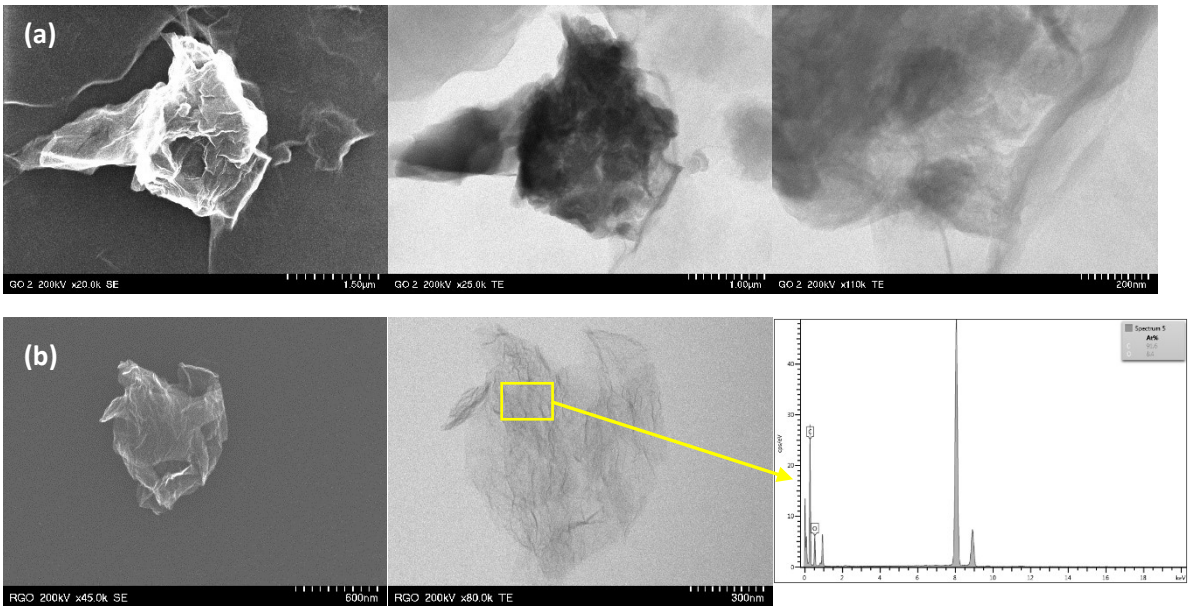

Figure S1. SEM/TEM images of pristine (a) GO and (b) rGO used for the preparation of GO/ZnO NW, and rGO/ZnO NW composites. (The difference in transparency for the two samples is a visible indication of the difference in the number of Carbon layers, that is GO is less transparent since it has 9 C layers, compared to rGO which shows only 3 C layers. The number of C layers was estimated from XRD data.)

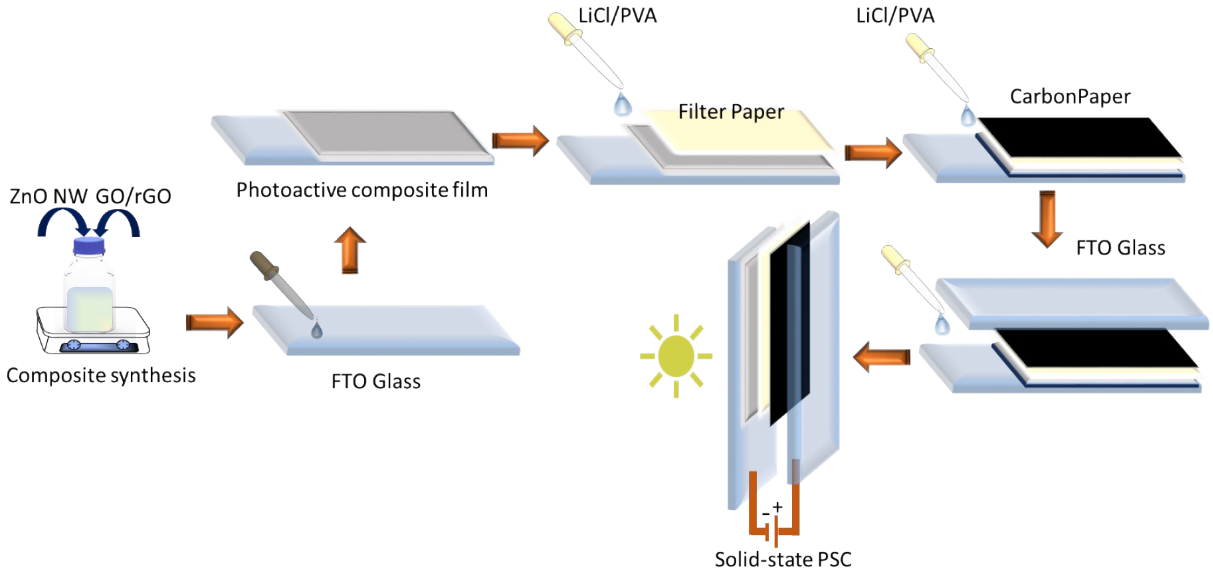

Figure S2. Schematic representation of PSC preparation route.

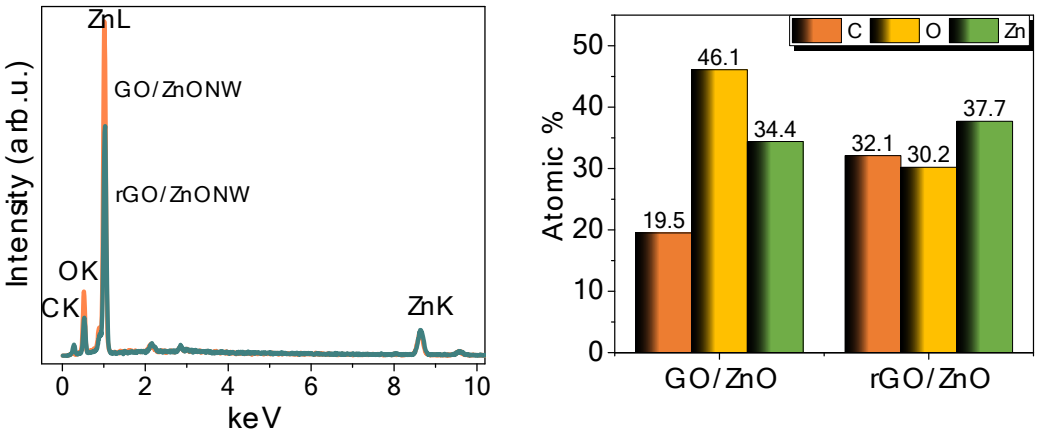

Figure S3. EDS spectra and atomic percentage (%) of the composite powders

CV Measurements

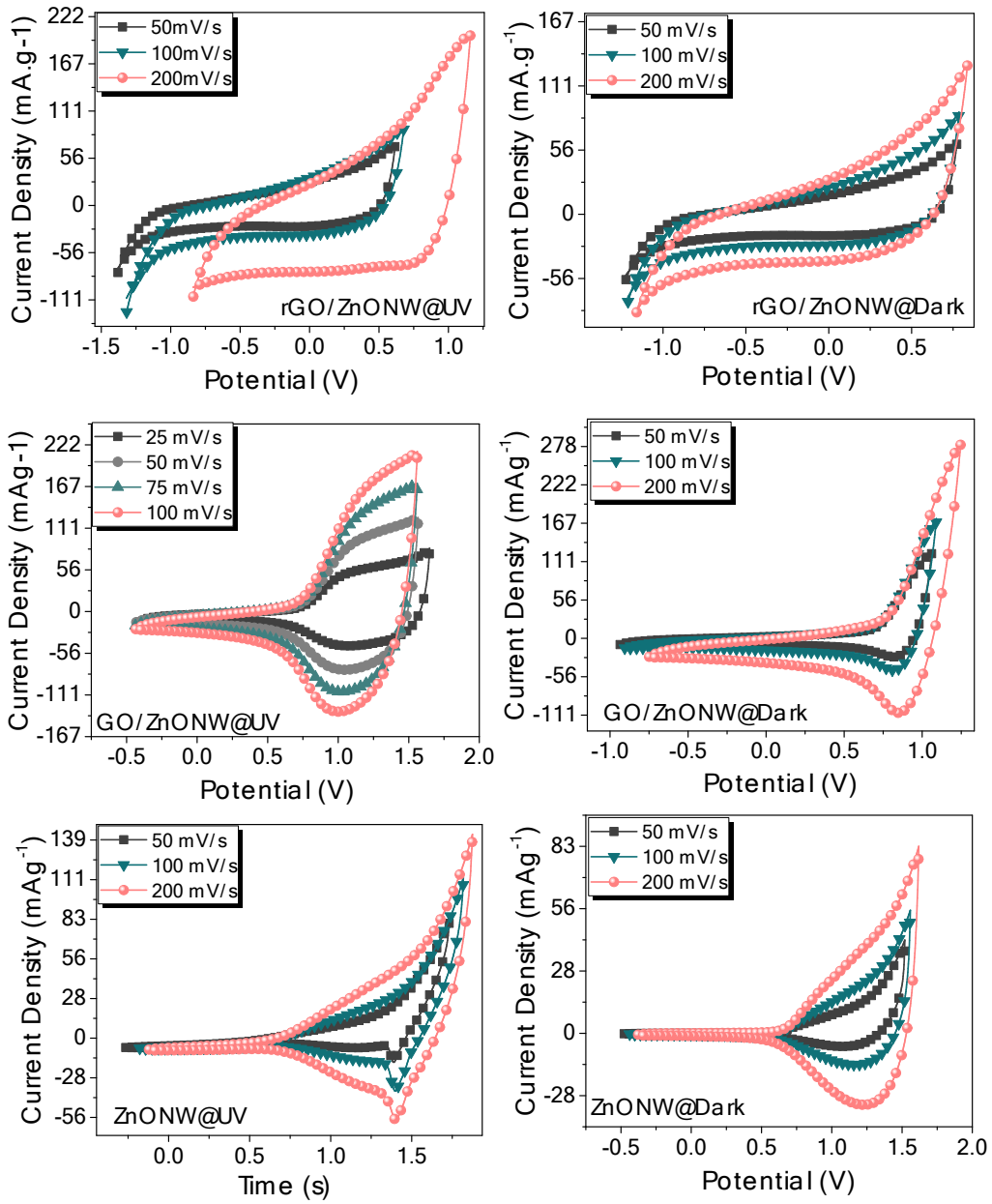

Figure S4. CV curves of the composite and pristine ZnO NW-based PSC devices at various current densities

GCD curves for composite P-SCs

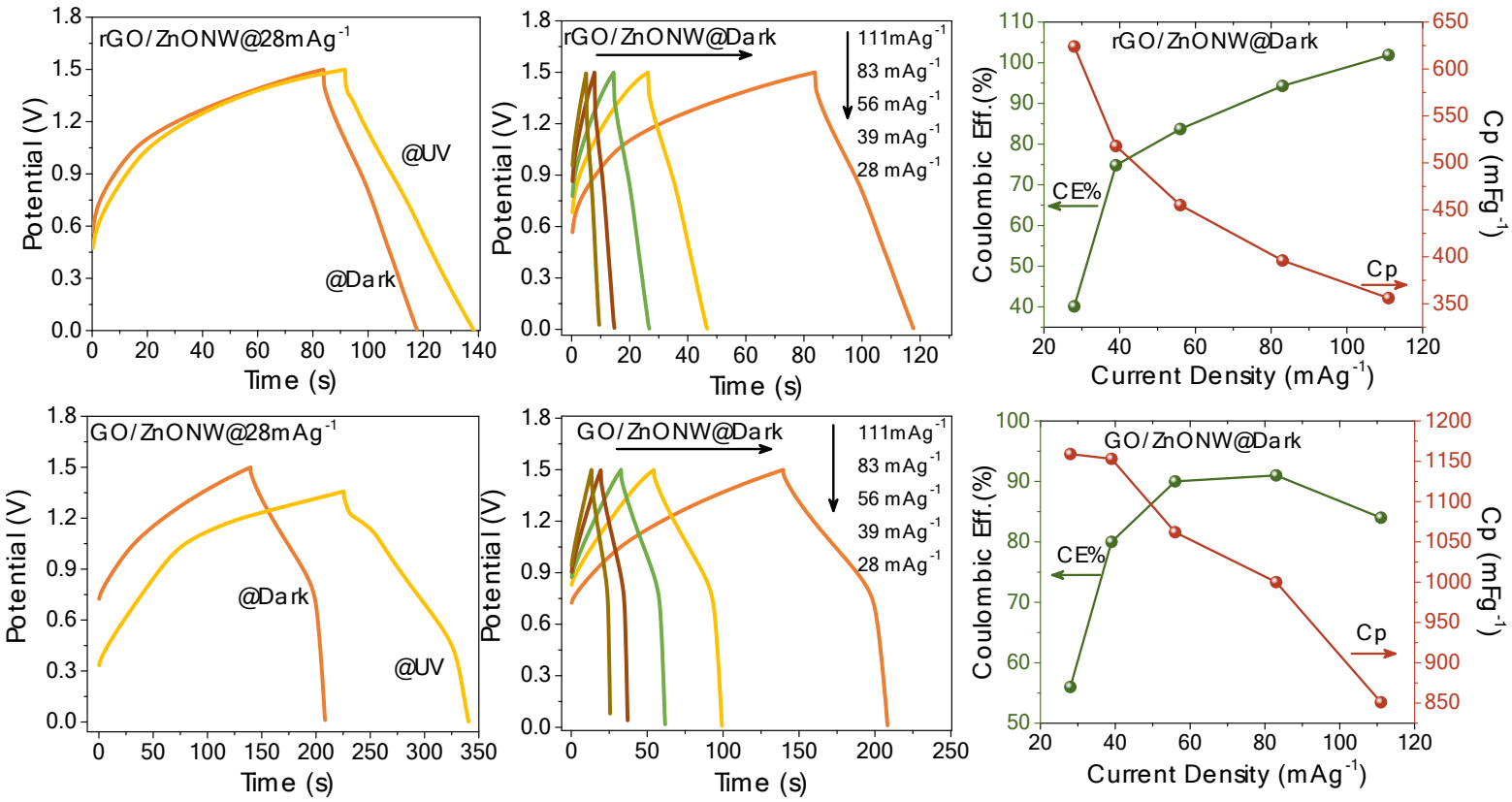

Figure S5. GCD curves and specific capacitance and CE% values of the composite PSC devices at various current densities under UV and in the dark.

GCD curves at lower current densities for composite PSCs

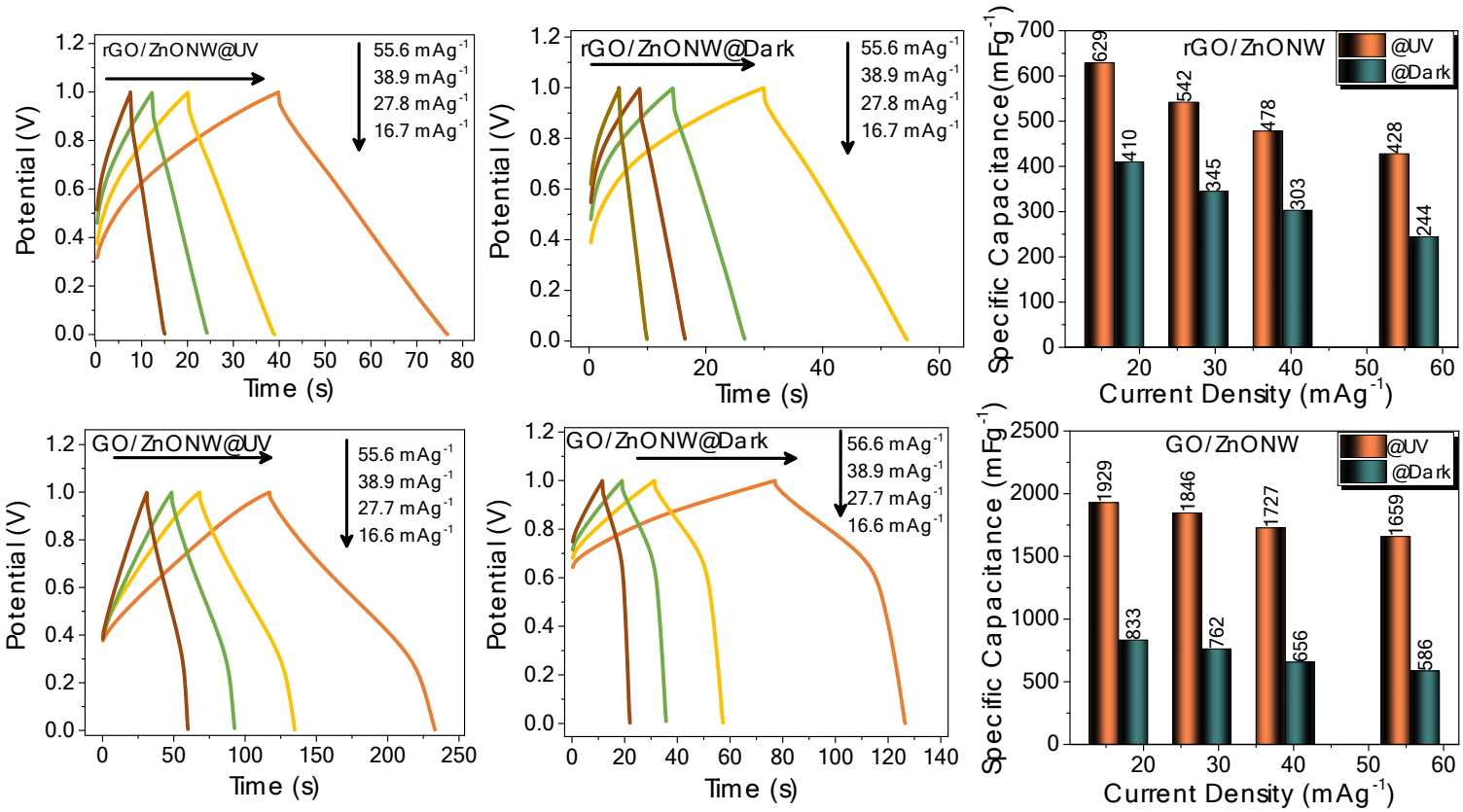

Figure S6. GCD curves and C_p values of the prepared PSC devices at various current densities obtained for the potential of 1V

Table S1. Comparison table for the performances of the PSC devices prepared from various photoelectrode materials.

PSC Device	Specific Capacitance	Current density	Energy density	Cycle number/ Cp Retention(%)	Ref./Year
GO/ZnONW	2200 mFg^{-1}	0.11 Ag^{-1}	2.5$Whkg^{-1}$	5k/99.8	This work
rGO/ZnONW	880 mFg^{-1}	0.11 Ag^{-1}	1.0$Whkg^{-1}$	5k/99.5	This work
Cu@Cu_2O (NPC@Cu_2O)*	782 Fg^{-1}	1.0 Ag^{-1}	NA	10k/99.5	S1/2019
ITO/P3HT	2.44 mF/cm^{-2}	0.02 mAg^{-1}	NA	NA	S2/2021
C/PAAQ//PAAQ/C	53 mF/cm^{-2}	0.5 mAg^{-1}	5$\mu Whcm^{-2}$	4k/90.0	S3/2020
CoS//AC	30 Fg^{-1}	2.0 Ag^{-1}	15.58 $Whkg^{-1}$	2k/97.9	S4/2019
Co_3O_4/g-C_3N_4	64.3 mF/cm^{-2}	26.6 $mAcm^{-2}$	12.9 $Whkg^{-1}$	5k/83.3	S5/2020
$BiVO_4$-RGO*	141.8 Fg^{-1}	0.2 Ag^{-1}	4.1 $mAh.g^{-1}$	110/80.0	S6/2020
$NiCo_2O_4$/ZnO//$NiCo_2O_4$/ZnO	25 mFg^{-1}	0.5 mAg^{-1}	1.35$mWhkg^{-1}$	2k/97.0	S7/2017
Bi_2O_3-Fe_3O_4*	306.6 Fg^{-1}	1.0 Ag^{-1}	NA	1k/60.0	S8/2021

**Liquid electrolyte system*

EIS analysis

Table S2. EIS parameters of the composite PSC under UV irradiation and at dark.

Device	UV-light	R1 (Ω)	R2 (Ω)	R3 (Ω)	C3 (mF)	a1	W ($\Omega s^{-1/2}$)
GO/ZnO NW	off	42.6	330.5	-260	3.9	0.895	1001
	on	24.5	401.4	227.1	$62.6x10^{-3}$	0.814	510.8
rGO/ZnO NW	off	39.9	43.3	5024	7.6	0.913	240.9
	on	39.1	19.9	1462	13.0	0.924	126.3

References

S1. C. An, Z.Wang, W. Xi, K. Wang, X. Liu, and Yi Ding, Nanoporous Cu@Cu2O hybrid arrays enable photoassisted supercapacitor with enhanced capacities, J. Mater. Chem. A, 2019, 7, 15691–15697

S2. W. J. Dong, W. S. Cho, and J.-L. Lee, Indium Tin Oxide Branched Nanowire and Poly(3-hexylthiophene)Hybrid Structure for a Photorechargeable Supercapacitor, ACS Appl. Mater. Interfaces 2021, 13, 22676 – 22683

S3. A.Das, S. Deshagani, P. Ghosal, M. Deepa, Redox active and electrically conducting cobalt telluride Nanorods/Poly(1 aminoanthraquinone) composite and photoactive Rose Bengal dye based photo-supercapacitor, Applied Material Today 19(2020)100592

S4. K Ashok Kumar, A Pandurangan, S Arumugam and M. Sathiskumar, Effect of Bi-functional Hierarchical Flower-like CoS Nanostructure on its Interfacial Charge Transport Kinetics, Magnetic and Electrochemical Behaviors for Supercapacitor and DSSC Applications, *Scientific Reports*, **9**, 1228 (2019)

S5. Liqi Bai,Hongwei Huang,Songge Zhang, Lin Hao,Zhili Zhang,Hongfen Li, Li Sun, Lina Guo,Haitao Huang,Yihe Zhang, Photocatalysis-Assisted Co3O4/g-CN p–n Junction All-Solid-State Supercapacitors: A Bridge between Energy Storage and Photocatalysis, Adv. Sci. 2020, 7, 2001939

S6. A. Roy, P. Majumdar, A photoelectrochemical supercapacitor based on a single BiVO4-RGO bilayer photocapacitive electrode, Electrochimica Acta 329 (2020) 135170

S7. B. D. Boruah, A. Misra, Photocharge-Enhanced Capacitive Response of a Supercapacitor, Energy Technol. 2017, 5, 1356 – 1363

S8. P. Pattananuwat, A. Khampuanbuta, H. Haromae, Novel electrode composites of mixed bismuth-iron oxide / graphene utilizing for photo assisted supercapacitors, Electrochimica Acta 370 (2021) 137741