Supplementary data

Photo-rechargeable Organic-Inorganic Dye Integrated Polymeric Power Cell with Superior Performances and Durability

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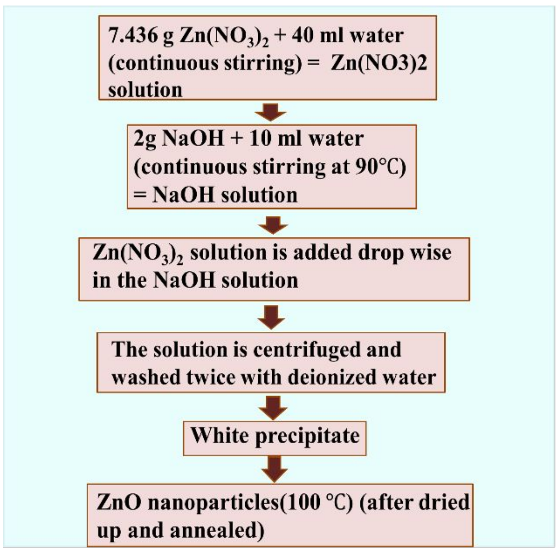
Table S1: Sample designations showing of respective compositions

Sample name	Amount of PVDF (g)	Percentage of SDS (mass %)	Amount of SDS (g)
PVDF	0.2	0	0
PDS1	0.2	1	0.002
PDS5	0.2	5	0.010
PDS10	0.2	10	0.020
PDS15	0.2	15	0.030
PDS20	0.2	20	0.040
PDS25	0.2	25	0.050

1. Synthesis of ZnO NPs:

7.436 g $Zn(NO_3)_2$ is mixed in a solution of 40 ml water by stirring vigorously in a magnetic stirrer to prepare a zinc nitrate ($Zn(NO_3)_2$) solution. After that 2g NaOH is added in 10 ml water separately by continuous stirring in a magnetic stirrer at 90°C to prepare another solution of sodium hydroxide. Now by using a burette, $Zn(NO_3)_2$ solution is added drop wise in the solution of NaOH for 20 minutes. Then we will collect a mixed solution which is washed twice with deionized water after centrifuging to collect a white precipitate. The obtained precipitate is completely dried up and annealed to get the ZnO (100°C) nanoparticles.



2. Characterization of ZnO NPs:

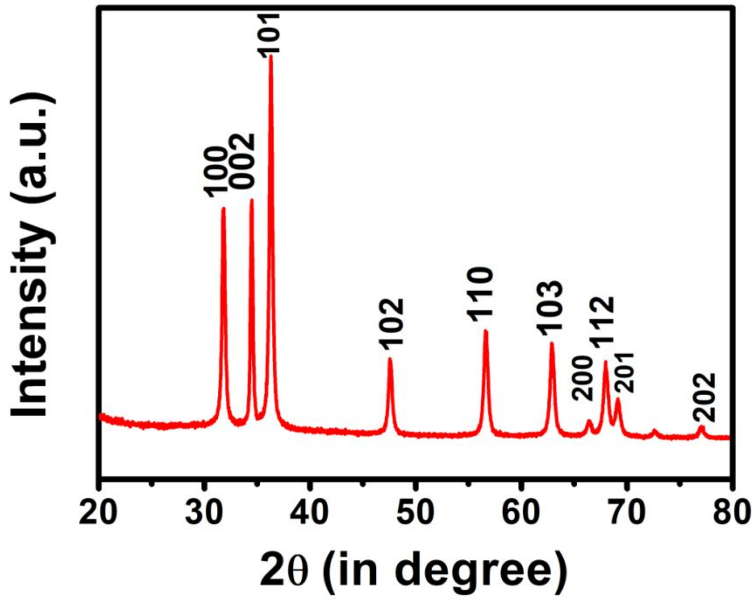


Figure S1: The characterization peaks at 2θ = 77°, 69°, 63°, 68°, 66.4°, 62.8°, 56.7°, 47.7°, 36.1°, 34.5°, 31.9° in the X-ray diffraction pattern of ZnO confirm the formation of ZnO nanoparticles. [1]

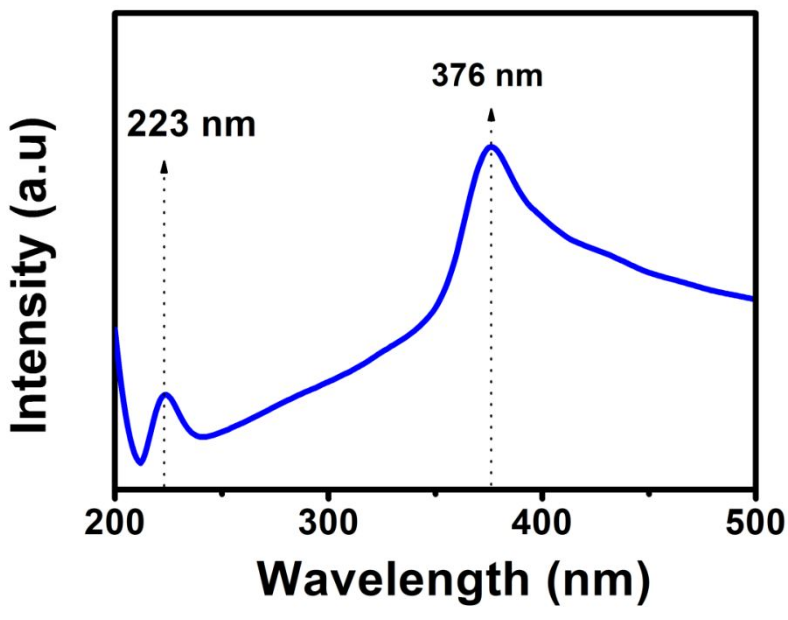


Figure S2: A sharp absorption peak is observed at 375.4 nm (~ 4.42 eV) and a very weak peak is also centred at 223 nm ((~ 5.56 eV) in the UV-Visible absorption spectroscopy of ZnO. [2]

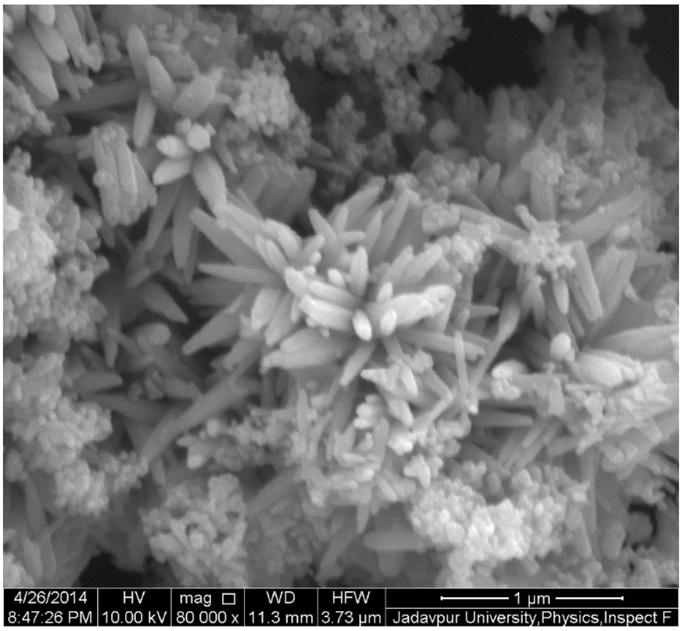


Figure-S3 is representing the morphological and microscopically structure of the ZnO nanoparticles. According to the FESEM image, some Nano-flower like structure is observed.

Table S2: Comparison of the overall performance (energy conversion efficiency, energy storage efficiency and overall efficiency) of our photo power cell (SCPPC) with the other photovoltaic devices previously reported.

References	**Articles Title**	**Energy density**	**Power density**	**Storage ability or specific capacitance**	**$\eta_{conversion}$ (%)**	**$\eta_{storage}$ (%)**	**$\eta_{overall}$ (%)**
[3]	The photocapacitor: An efficient self-charging capacitor for direct storage of solar energy	-	-	0.69 F/cm^2	-	-	-
[4]	Integration of solid-state dye-sensitized solar cell with metal oxide charge storage material into photoelectrochemical capacitor.	0.17 mWh /cm^2	0.34 mW/cm^2	407 F/g (3.26 F/cm^2)	0.8	-	-

[5]	An Integrated Power Pack of Dye-Sensitized Solar Cell and Li Battery Based on Double-Sided TiO2 Nanotube Arrays	-	-	-	1.95	42	0.82
[6]	Integrated Power Fiber for Energy Conversion and Storage	9.5×10^{-7} Wh/c m^2	4.2 mW/cm ^{2}	19 mF/cm^2	5.41	46	2.1
[7]	Integrated Photo-Supercapacitor Based on Bi-polar TiO 2 Nanotube Arrays with Selective One-Side Plasma-Assisted Hydrogenation	6.662 × 10 −8 Wh/c m^2	-	1.289 mF/cm^2	3.17	50	1.61
[8]	All Silicon Electrode Photocapacitor for Integrated Energy Storage and Conversion	0.17 µWh/c m^2	22 µWh/c m^2	3.5 mF/cm^2	4.8	43	2.1
[9]	Dye-Sensitized Solar Cell with Energy Storage Function through PVDF/ZnO Nanocomposite Counter Electrode.	1.4 mWh kg^{-1}	-	-	3.7	-	-
[10]	An integrated device for both photoelectric conversion and energy storage based on free-standing and aligned carbon nanotube film.	-	-	54 F/g	2.31	34	0.79
[11]	The novel “energy fiber” by coaxially integrating dye-sensitized solar cell and electrochemical capacitor.	-	0.27m W/cm^2	3.32 mF/cm^2	2.73	75.7	-

[12]	An ultrahigh-rate electrochemical capacitor based on solution-processed highly conductive PEDOT:PSS films for AC line-filtering	1.77 mW h cm^{-3}	N.A.	994 μF cm^{-2} Or 16.6 F cm^{-3}	-	-	-
[13]	Perovskite Photovoltachromic Supercapacitorn with All-Transparent Electrodes.	13.4 and 24.5 mWh/m^2	187.6 and 377.0 mW/m^2	286.8 and 430.7 F/m^2	7.8	-	-
Present Work	**Photo-rechargeable Organic-Inorganic Dye Integrated Printable Polymeric Power Cell with Superior Performances and Durability**	**90 mWh/m^2**	**54 W/m^2**	**450 F/m^2 or 0.045 F/cm^2**	**4.12**	**89**	**3.68**

Video S1, S2 and S3: Demonstration of lighting up commercially available blue, green and red LEDs using our SCPPC1 as a power bank.

Reference:

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