Supplementary Information (SI)

Titanium mesh based fully flexible highly efficient quantum dots sensitized solar cells

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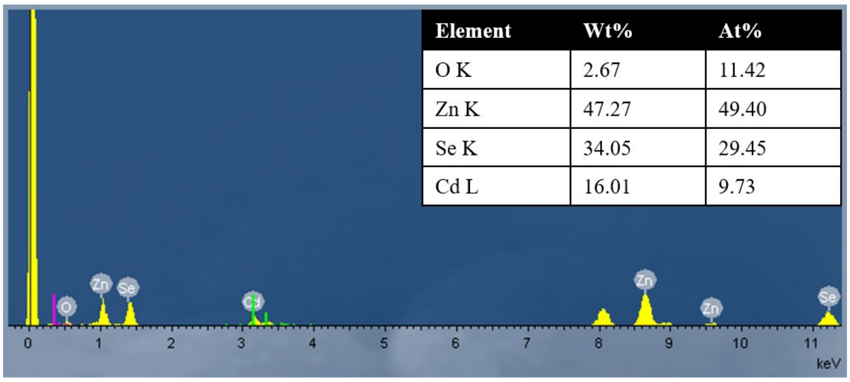

Element	Wt%	At%
O K	2.67	11.42
Zn K	47.27	49.40
Se K	34.05	29.45
Cd L	16.01	9.73

Figure S1. EDS spectrum of the ZnO/ZnSe/CdSe nanostructure after 4h of ion exchange with Cd^{2+} solution and chemical composition table (inset).

Synthesis and Characterization of Mesoporous Carbon Microspheres

The mesoporous carbon (MC) microspheres were synthesized with controllable structure using a spray drying method according to literature method.[1] Briefly, the resorcinol (9.71 g) and formaldehyde (14.31 g, 37%) were added into the silica sols (7 nm, Ludox SM-30) with continuous magnetic stirring, after which the sol was further diluted with distilled water to the desired content (% w/v). The weight ratio of resorcinol-formaldehyde (RF)/SiO_2 was adjusted to 0.5, 0.75, 1.0, respectively. The mixed sol was stirred for 1 h at 40 °C, and then spray-dried using a spray-dryer (Blon-6000y, Shanghai Bilon Instrument Co., Ltd). The solution was pumped into the nozzle at the rate of 500-1000 ml/h, together with a constant spray air flow. The liquid was atomized into fine droplets at a constant pressure of 0.3 MPa. The inlet temperature was set to 120 °C, generally the outlet temperature was in the range of 58-65 °C. Fine powder was discharged continuously from the drying chamber and then collected using a cyclone separator. The powder was then carbonized in a nitrogen flow at 800 °C for 3 h with a heating rate of 5 °C min^{-1}. Finally, the MCs were obtained by the dissolution of silica nanoparticles in 2 M NaOH solution at 80 °C, washed with distilled water and ethanol, and dried at 100 °C.

References

1. X. Li, J. Zhou, J. Wang, W. Qiao, L. Ling and D. Long, *RSC Adv.,* 2014, **4**, 62662.

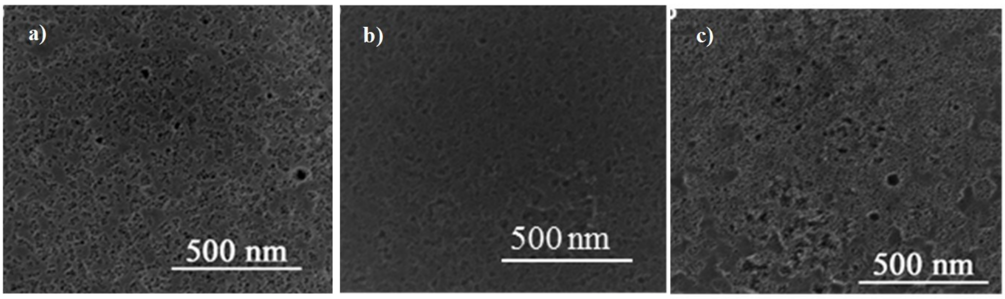

Figure S2. Typical SEM images of different structure MCs, a) MC-0.5; b) MC-0.75; c) MC-1.0.

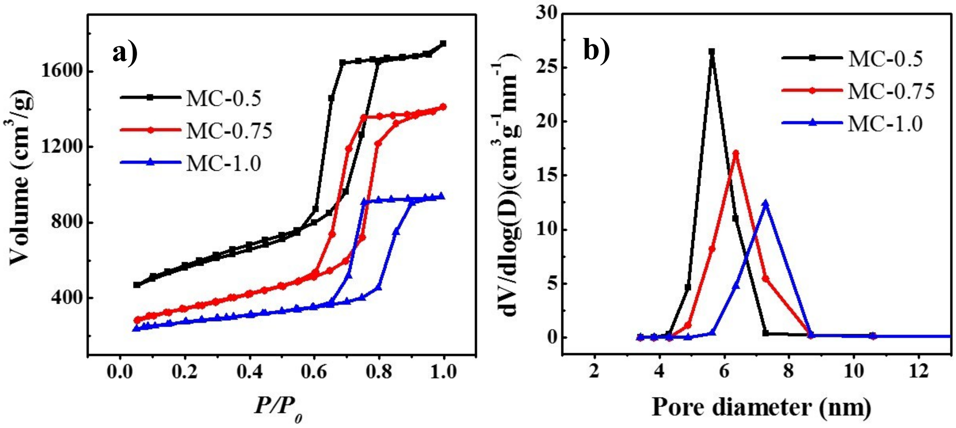

Figure S3. (a) Typical N_2 adsorption-desorption isotherms at 77 K of different structure MCs; (b) resultant BJH pore size distributions of different structure MCs.

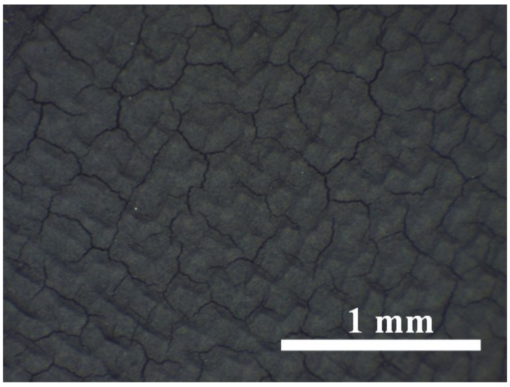

Figure S4. top view image of the front side of a MC-0.75/Ti CE.

Table S1. Pore parameters of different structure MCs.

Sample	S_{BET} [a] (m^2/g)	V_{Total} [b] (cm^3/g)	V_{Meso} (cm^3/g)
MC-0.5	1220	2.7	2.5
MC-0.75	1205	2.3	2.2
MC-1.0	928	1.5	1.3

[a] BET specific surface area; [b] Total pore volume ($p/p_0 = 0.985$).

Table S2. Characteristics of investigated CEs under their optimum conditions, and EIS parameters (series resistance R_s, and charge transport resistance R_{ct}) of the symmetric cells assembled from two identical CEs.

CEs	R_s (Ω cm^2)	$2R_1$ (Ω cm^2)	$2R_{ct}$ (Ω cm^2)
MC-0.5/Ti	0.91	0.42	3.40
MC-0.75/Ti	0.92	0.41	3.06
MC-1.0/Ti	0.82	0.45	4.02

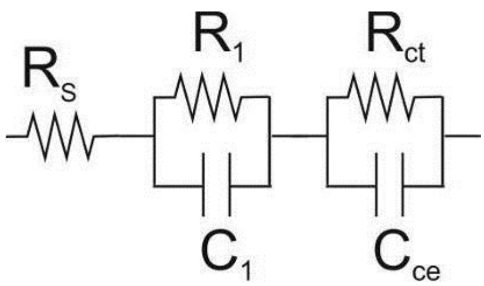

Figure S5. Simulation circuit used for fitting EIS. R_s accounts for series resistance, R_1 and C_1 represent the charge transfer resistance and capacitance at MC/Ti mesh interface, R_{ct} and C_{ce} represent the charge transfer resistance and capacitance at CE/electrolyte interface.

Table S3. Photovoltaic performance parameters for QDSCs with various Cd^{2+} ion exchange duration under one full sun illumination.

Duration	J_{sc} (mA·cm^{-2})	V_{oc} (V)	FF	PCE (%)
0	3.72	0.183	0.478	0.33
	3.54	0.191	0.479	0.32
	3.52	0.186	0.471	0.31
Average	3.59	0.187	0.476	0.32 ± 0.01
1 h	8.96	0.538	0.493	2.38
	8.74	0.532	0.485	2.26
	8.67	0.528	0.482	2.21
Average	8.79	0.533	0.487	2.27 ± 0.08
2 h	10.76	0.565	0.531	3.23
	10.98	0.554	0.523	3.18
	10.23	0.571	0.528	3.09
Average	10.66	0.563	0.527	3.16 ± 0.07
3 h	13.12	0.573	0.528	3.97
	12.87	0.581	0.526	3.93
	12.90	0.577	0.530	3.94
Average	12.96	0.577	0.528	3.95 ± 0.02
4 h	15.32	0.638	0.520	5.08
	15.05	0.631	0.524	4.98
	15.43	0.627	0.532	5.14
Average	15.27	0.632	0.525	5.07 ± 0.08
5 h	14.47	0.601	0.519	4.51
	13.79	0.605	0.526	4.39
	14.23	0.593	0.532	4.48
Average	14.16	0.600	0.526	4.46 ± 0.07