

Supplementary Information

**Ethylene glycol-based solar-thermal fluids dispersed
with reduced graphene oxide**

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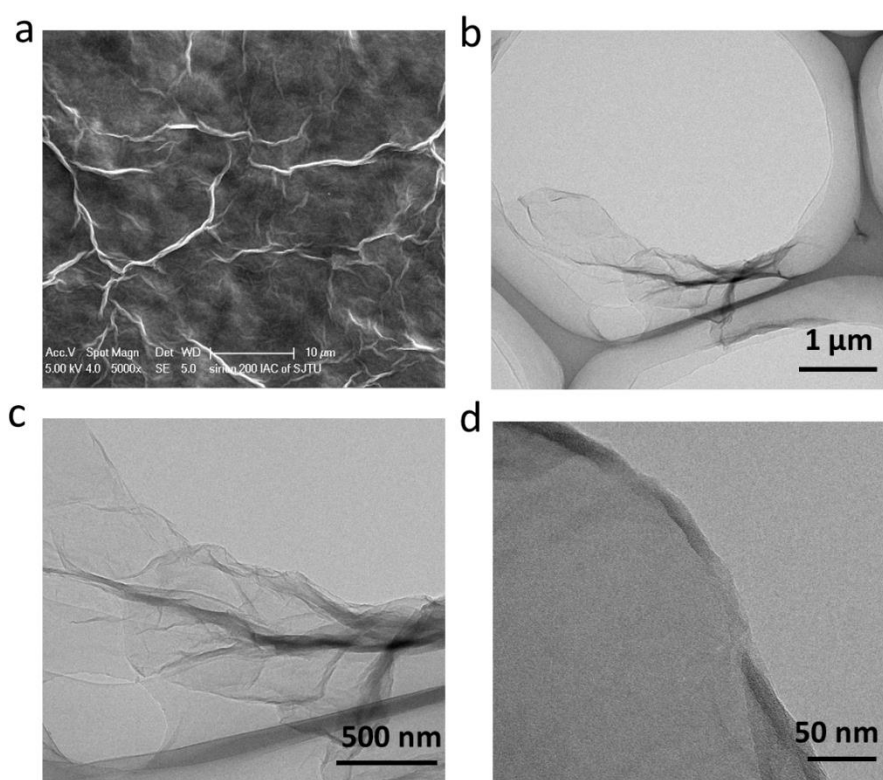


Fig. S1 (a) SEM image of ethanol-wetted GO; (b-d) TEM images of ethanol-wetted GO under different magnifications.

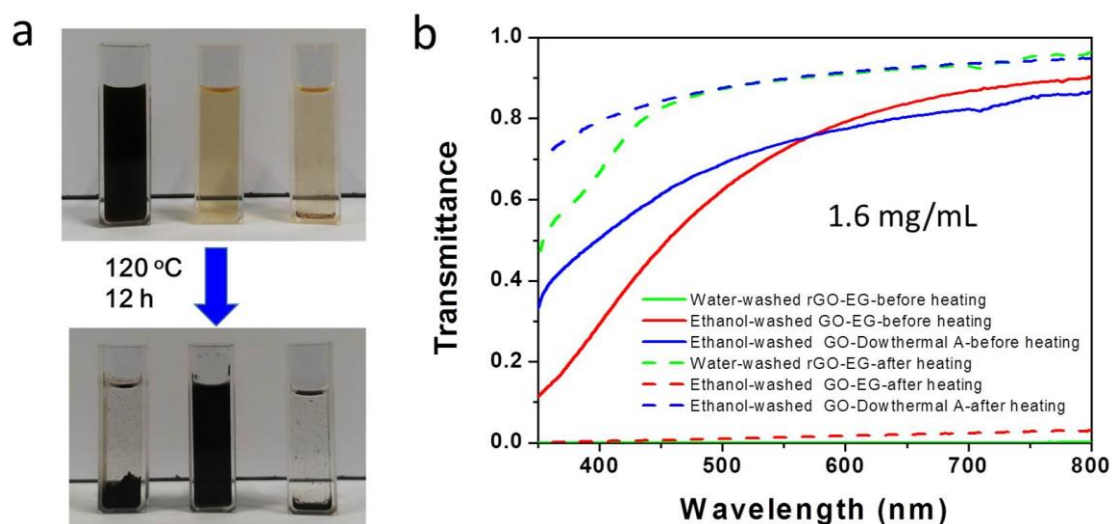


Fig. S2 (a) Photographs of EG fluids dispersed with 1.6 mg/mL of water washed rGO (left), ethanol-washed GO (middle), and ethanol-washed GO-Dow thermal A oil fluids before (top) and after (bottom) heating at 120 °C for 12 h; (b) Comparison of transmittance spectra of the fluids before and after heating.

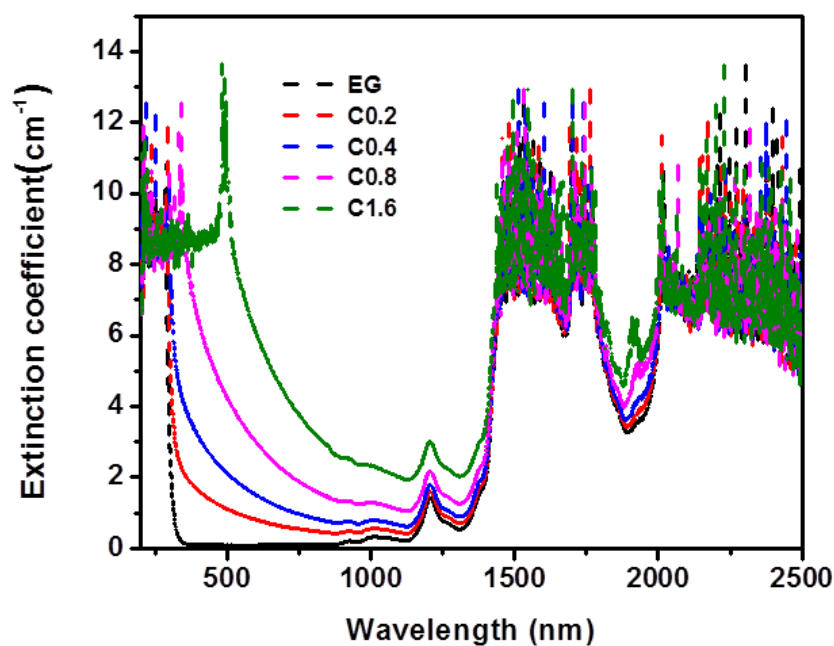


Fig. S3 Extinction coefficient of EG and rGO-EG fluids with different concentration of rGO (C0.2:0.2 mg/mL; C0.4:0.4 mg/mL; C0.8:0.8 mg/mL; C1.6:1.6 mg/mL).

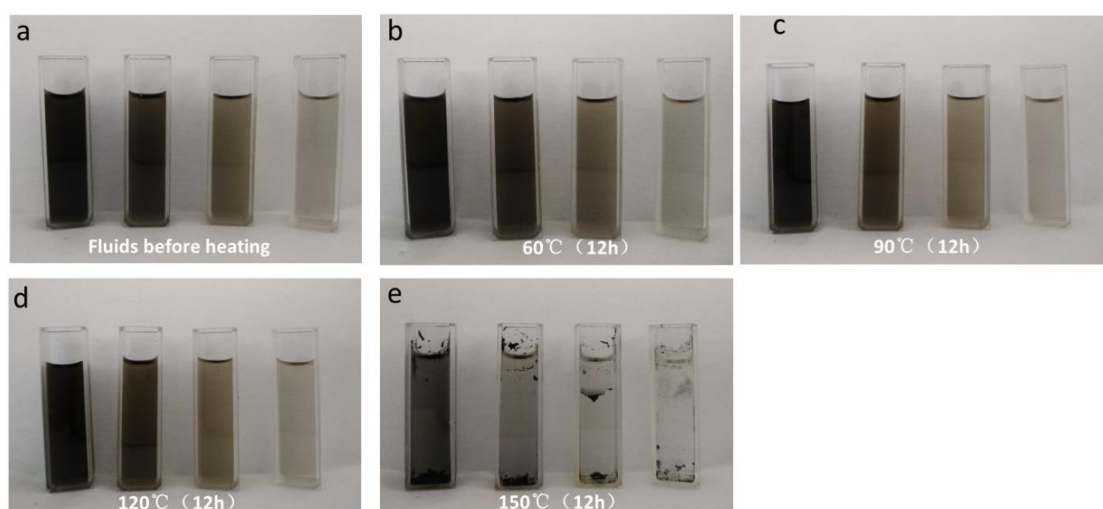


Fig. S4 (a) Photographs of as-prepared rGO-EG fluids with different loading (from left to right: 1.6 mg/mL, 0.8 mg/ml, 0.4 mg/mL, 0.2 mg/mL); (b) Photographs of rGO-EG fluids after heating at 60 °C for 12 h; (c) Photographs of rGO-EG fluids after heating at 90 °C for 12 h; (d) Photographs of rGO-EG fluids after heating at 120 °C for 12 h; (e) Photographs of rGO-EG fluids after heating at 150 °C for 12 h.

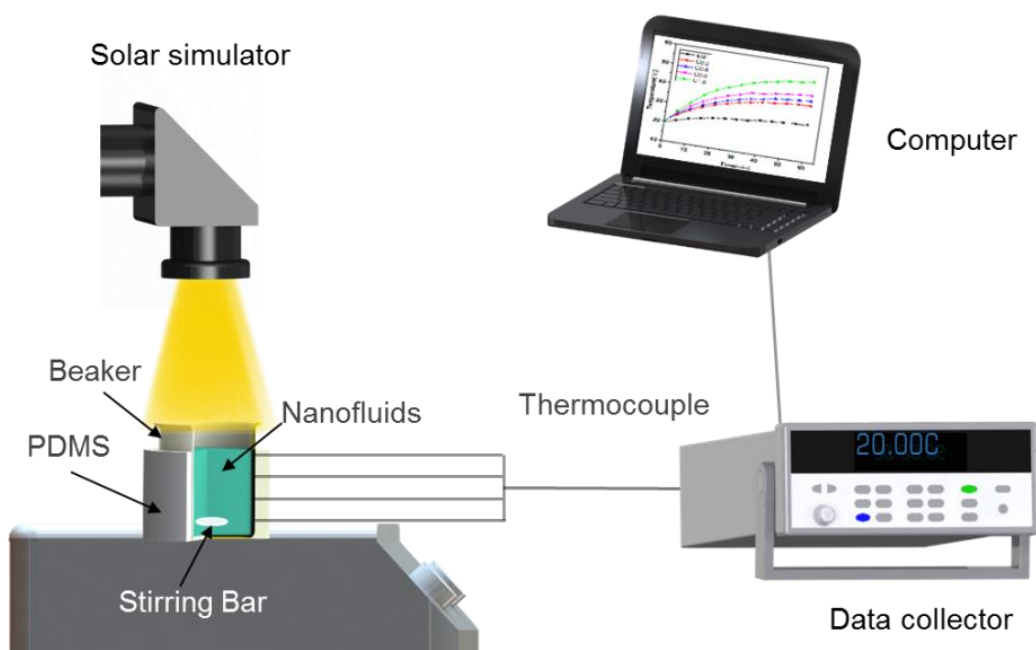


Fig. S5 Schematic of experimental setup for direct absorption-based solar-thermal energy harvesting

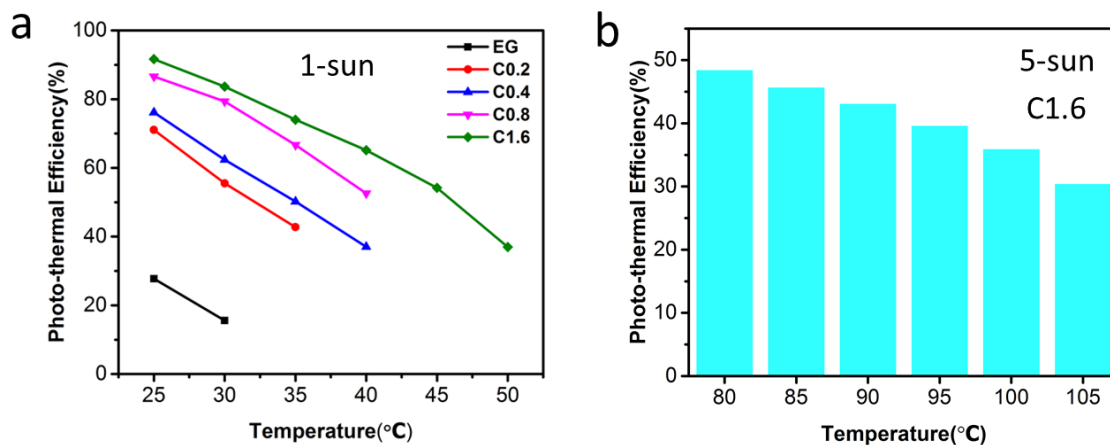


Fig. S6 (a) Photothermal conversion efficiency of stirred EG and rGO-EG fluids under 1 kW/m^2 solar irradiation; (b) Photothermal conversion efficiency of stirred rGO-EG fluids (1.6 mg/mL) under 5 kW/m^2 solar irradiation.

Table S1 Specific heat of EG and rGO-EG fluids at different temperatures

Specific Heat (J*g ⁻¹ K ⁻¹) Temperature (°C)	EG	C0.2	C0.4	C0.8	C1.6
36	2.07	2.02	1.97	1.94	1.93
45	2.16	2.15	2.01	1.99	1.96
55	2.14	2.07	1.96	1.94	1.92
65	2.24	2.11	2.07	2.01	1.99
75	2.53	2.42	2.37	2.36	2.31

Table S2 Viscosity of EG and rGO-EG fluids at different temperatures

Viscosity (mPa.s) Temperature (°C)	EG	C0.2	C0.4	C0.8	C1.6
20	18.63	19.28	18.60	18.78	19.82
25	15.37	15.76	15.55	15.26	16.43
30	12.66	13.02	12.90	12.73	13.71
35	10.24	10.75	10.95	10.45	11.41
40	8.63	8.83	8.86	8.44	9.01
45	7.26	7.34	7.60	7.04	7.63
50	6.29	6.39	6.47	6.08	6.58
55	5.30	5.50	5.76	5.34	5.73
60	4.71	4.80	5.13	4.68	5.08
65	4.14	4.35	4.36	4.08	4.51
70	3.69	3.92	3.90	3.65	4.11
75	3.28	3.56	3.52	3.19	3.73
80	2.99	3.22	3.12	2.82	3.42

Table S3 Thermal Conductivity of EG and rGO-EG fluids at room temperature

Sample	Average Thermal conductivity(W/m K)	Standard Deviation
EG	0.2599	0.0058
C0.2	0.2612	0.0046
C0.4	0.2624	0.0054
C0.8	0.2651	0.0046
C1.6	0.2673	0.0070

Table S4 Zeta potential of rGO-EG fluids before and after heating

Sample	Absolute Zeta potential (mV)				
	1 st	2 nd	3 rd	Average	Standard Deviation
Fluids before heating	32.72	31.04	30.51	31.42	1.15
Fluids after heating (120 °C-12 h)	25.43	27.08	24.6	25.70	1.26
Fluids after heating (150 °C-12 h)	14.57	10.87	18.85	14.76	3.99