Supplementary Information

Trash to treasure: converting plastic waste into useful graphene foil

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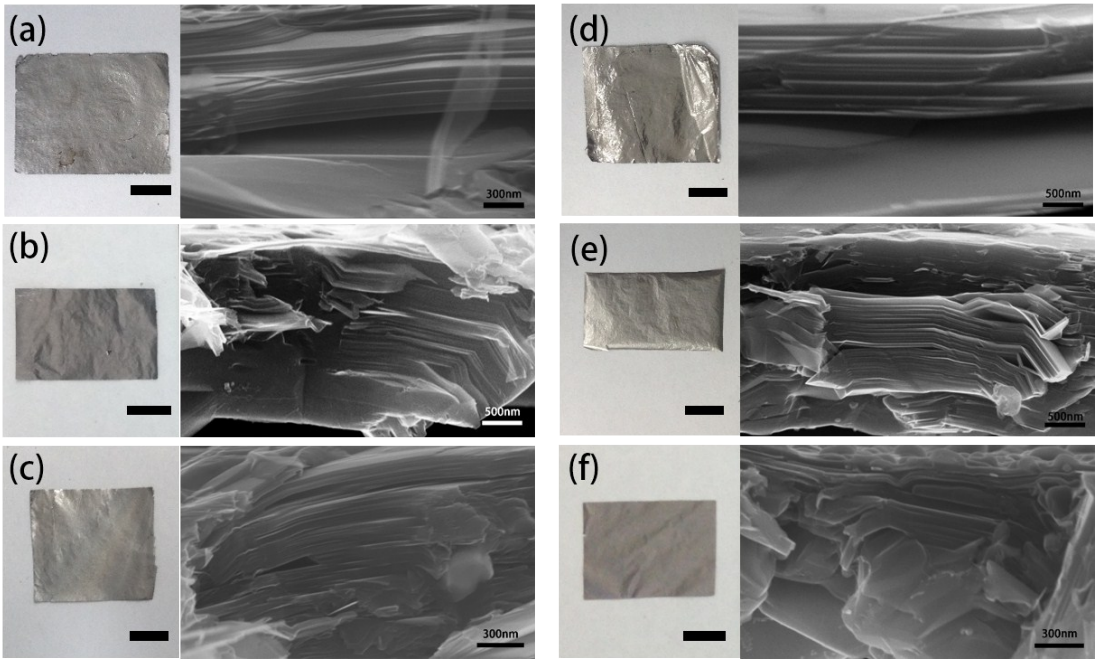


Fig. S1. Photos and SEM images of the GFs with different carbon sources. (a) PET. (b) PE. (c) PVC. (d) PP. (e) PS. (f) PMMA. Scale bar is 1 cm.

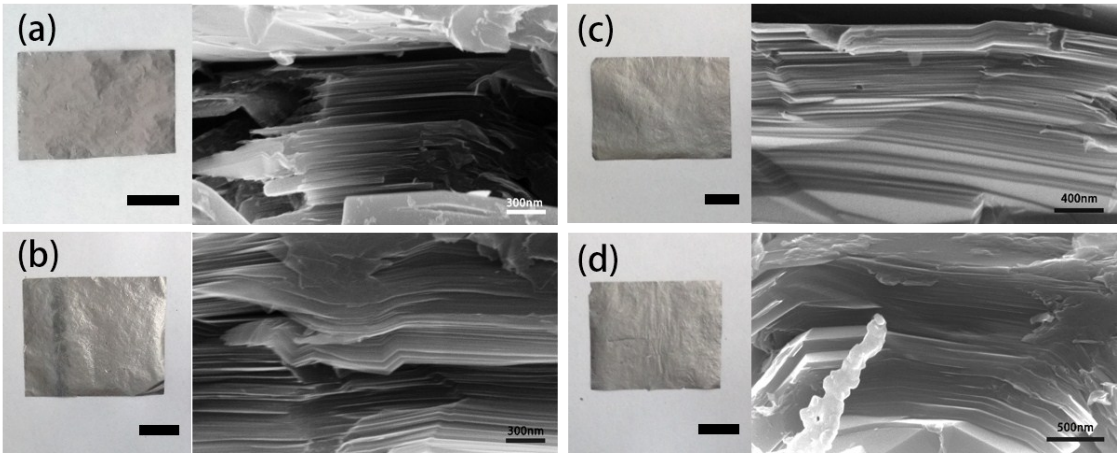


Fig. S2. Photos and SEM images of the GFs with different PE plastics as carbon sources. (a) PE (valve bag). (b) PE (clean agent bottle). (c) PE (preservative film). (d) PE (plastic bag). Scale bar is 1 cm.

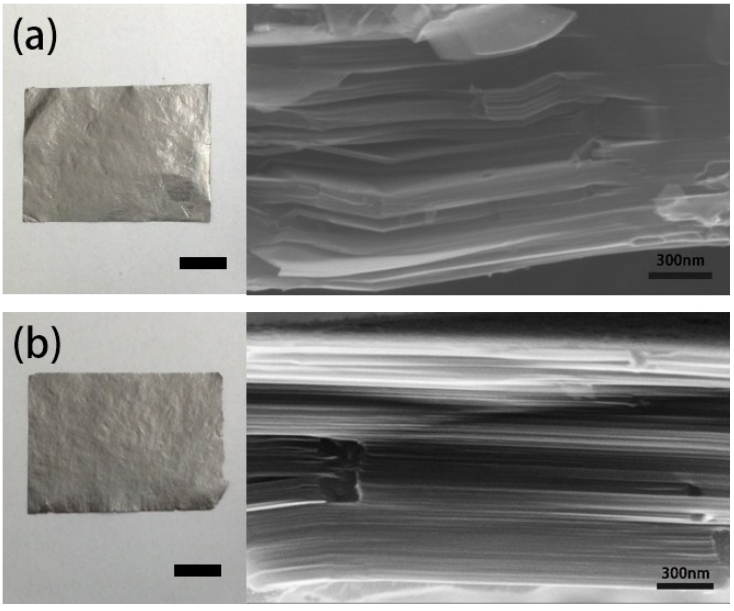
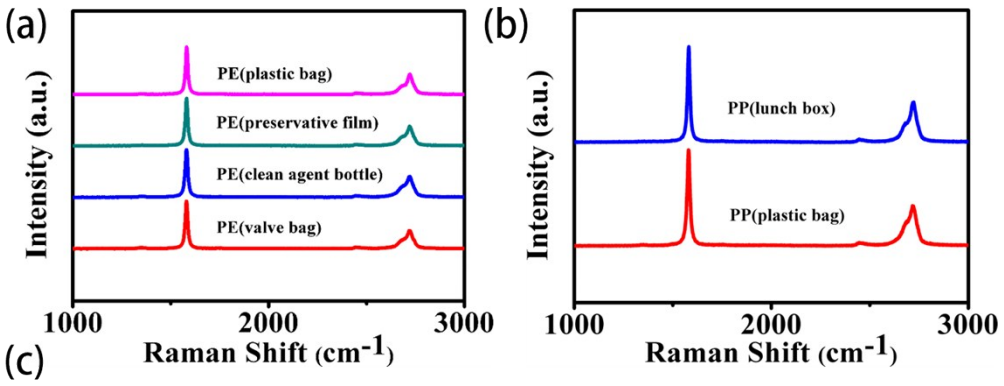


Fig. S3. Photos and SEM images of the GFs with different PP plastics as carbon sources. (a) PP (plastic bag). (b) PP (lunch box). Scale bar is 1 cm.



(c)

Sample	PE(valve bag)	PE(clean agent bottle)	PE(preservative film)	PE(plastic bag)	PP(plastic bag)	PP(lunch box)
I_D/I_G	0.068	0.055	0.034	0.050	0.029	0.024

Fig. S4. Raman spectra of the GF synthesized with different (a) PE plastic materials. (b) PP plastic materials. (c) The ratio of D band to G band of different plastic materials.

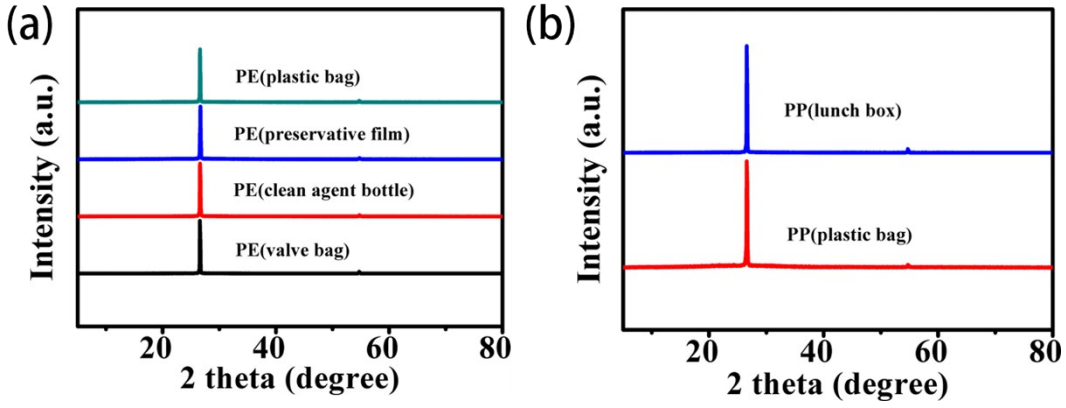


Fig. S5. XRD spectra of the GF synthesized with different (a) PE plastic materials. (b) PP plastic materials.

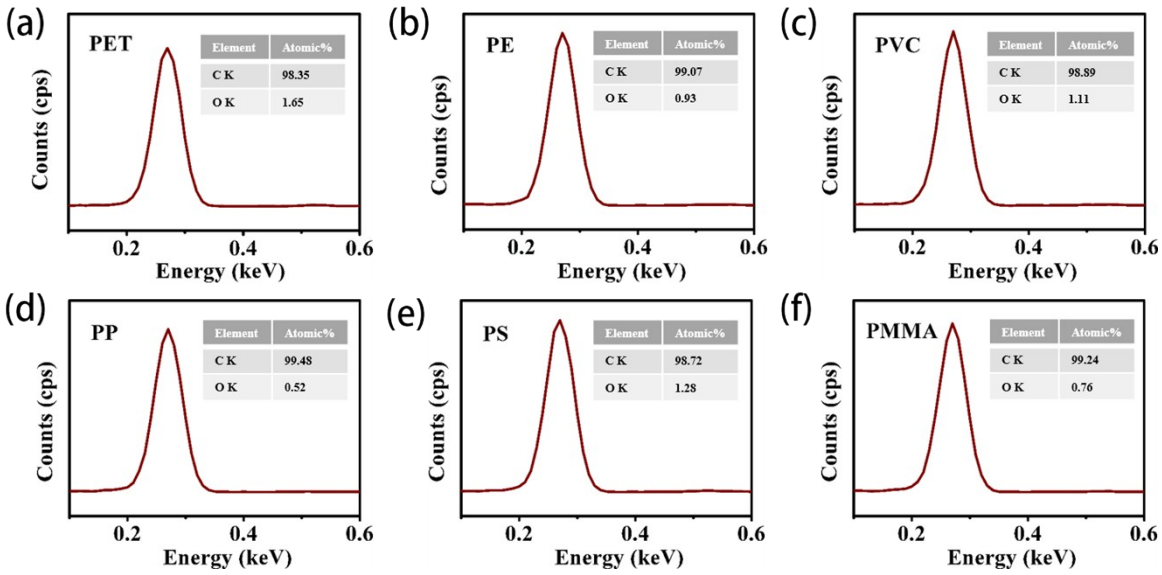


Fig. S6. EDS spectra of the GFs with different carbon sources. (a) PET. (b) PE. (c) PVC. (d) PP. (e) PS. (f) PMMA.

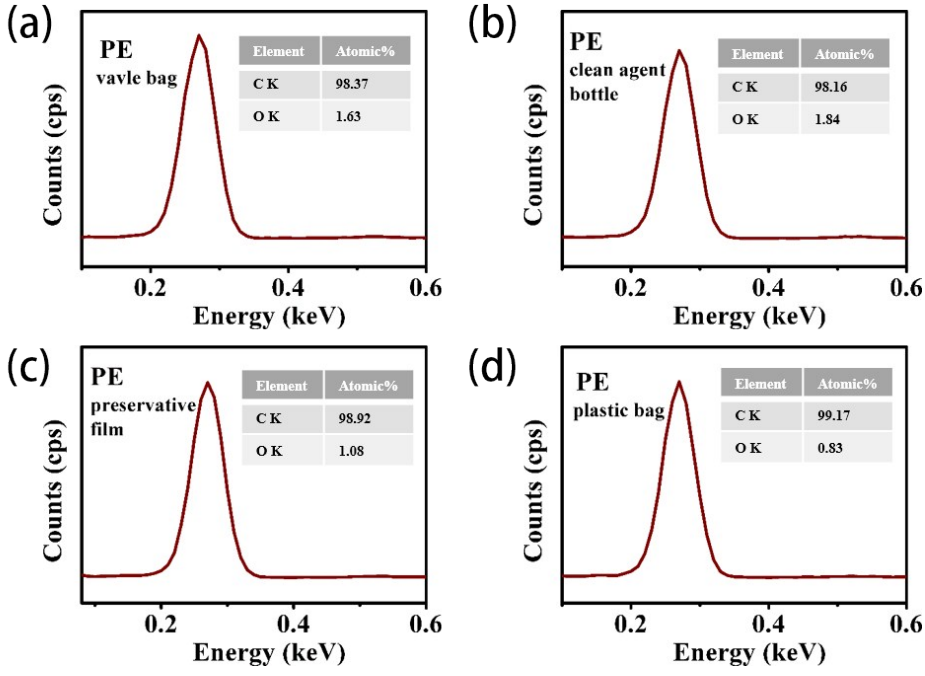


Fig. S7. EDS spectra of the GFs with different PE plastics as carbon sources. (a) PE (valve bag). (b) PE (clean agent bottle). (c) PE (preservative film). (d) PE (plastic bag).

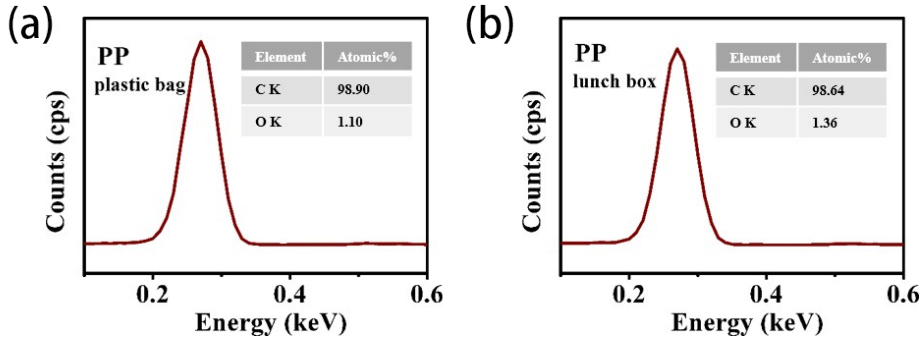


Fig. S8. EDS spectra of the GFs with different PP plastics as carbon sources. (a) PP (plastic bag). (b) PP (lunch box).

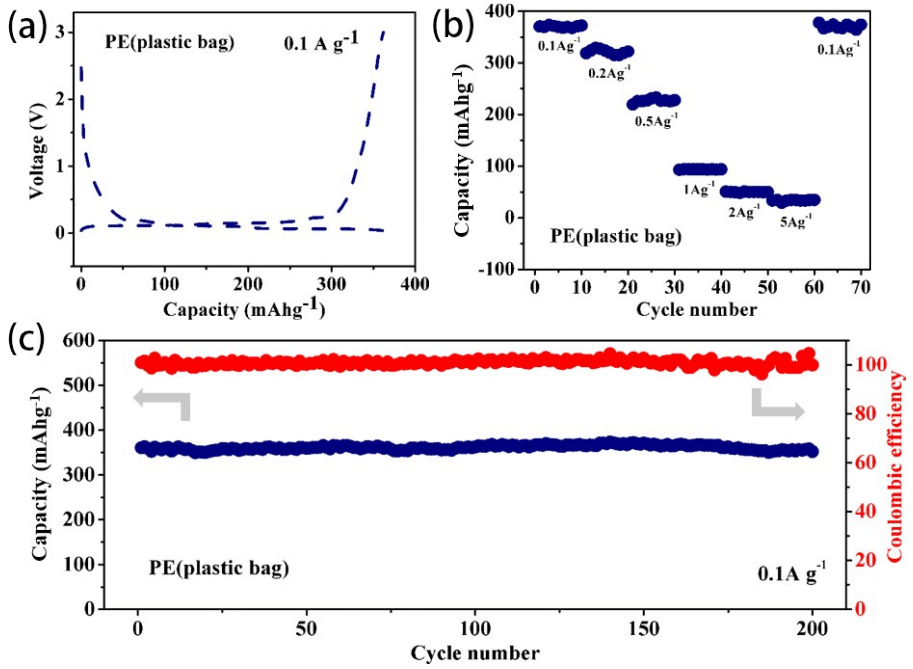


Fig. S9. Electrochemical performances of GF anode using PE (plastic bag) as raw material. (a) Discharge/charge voltage profiles of GF anode at current density of 0.1 A g^{-1}. (b) Rate capability of the cell at various current rates from 0.1 to 5 A g^{-1}. (c) Cycling performance and Coulombic efficiency of the GF anode at 0.1 A g^{-1}.

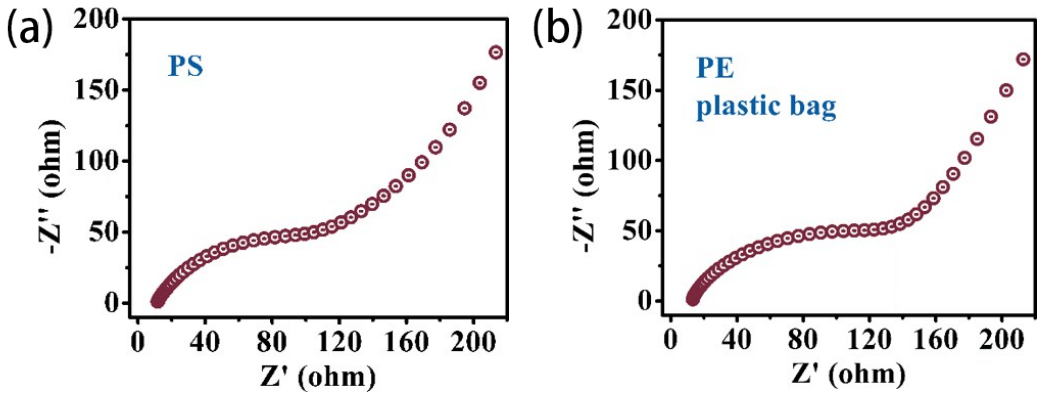


Fig. S10. Impedance spectra of half cells using the different carbon sources. (a) PS. (b) PE (plastic bag).

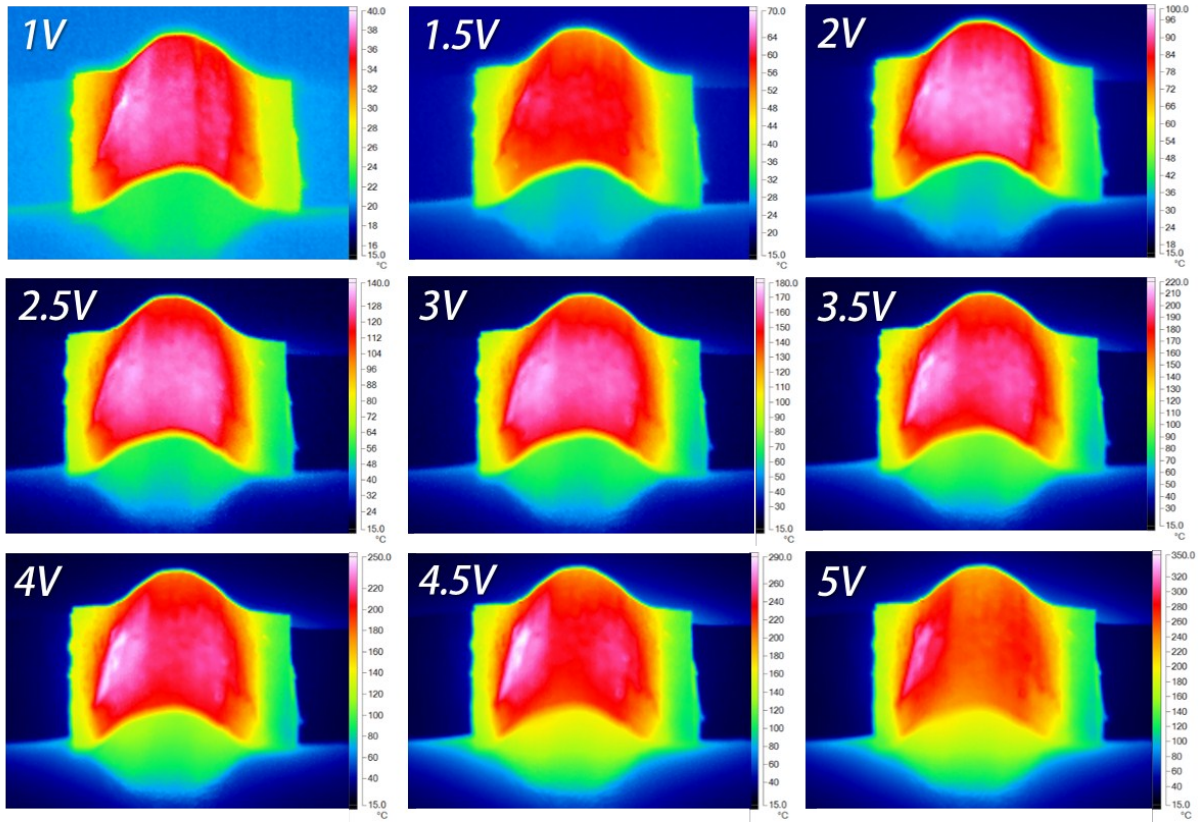


Fig. S11. Infrared pictures of the film with saturated temperature under different input voltages.

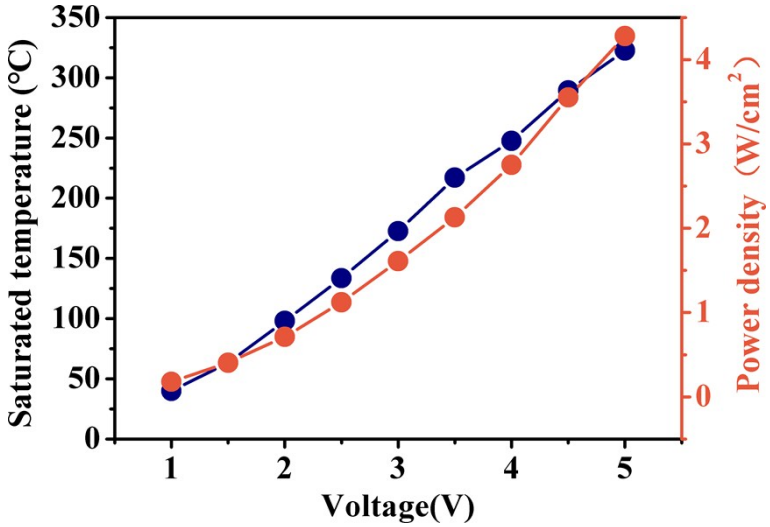


Fig. S12. Saturated temperature and input electrical power density as a function of input voltage.

Table S1. The amount of various carbon sources.

Sample	**PET**	**PE**	**PVC**	**PP**	**PS**	**PMMA**
Amount (mg)	500	250	1000	300	200	600
Sample	**PE Valve bag**	**PE Clean agent bottle**	**PE Preservative film**	**PE Plastic bag**	**PP Plastic bag**	**PP Lunch box**
Amount (mg)	250	300	250	250	200	300

Table S2. Comparison of heat performances in this work with previous reported references related to graphene heaters.

	Saturated temperature (℃)	**Applied voltage (V)**	**Heating time (S)**	**Ref.**
Graphene/glass	80	40	~120	32
Reduced graphene/quartz	206	60	~120	33
$AuCl_3$-doped graphene/glass	110	12	~300	34
Wet-spun graphene film/PI	177	29	~120	35
Carbon fiber felt/shape memory polymers	134	25	~70	36
Fabrics of graphene fiber	382	10	~0.7	37
Graphene foil	323	5	~1 s	Our work