Supporting Information

Low-temperature Molten Salt Ion Regeneration Strategy towards Green and Efficient Spent Graphite Recycle

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1. Supplementary Fig.s and Tables

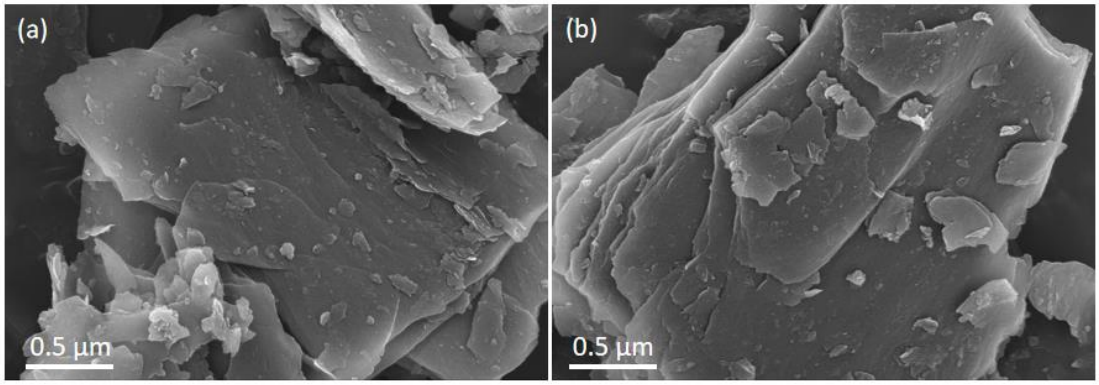

Fig. S1 SEM images of (a) SG and (b) CPG.

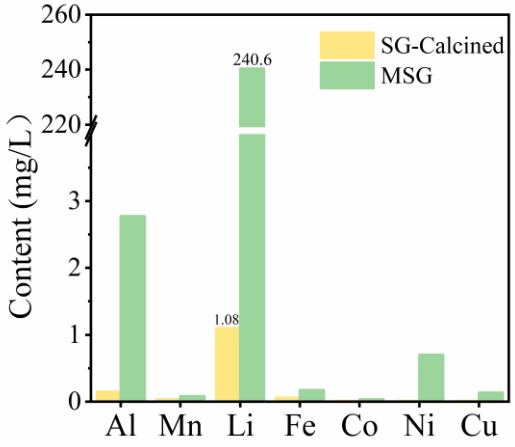

Fig. S2 ICP–OES test results of leaching solutions from SG-Calcined and MSG.

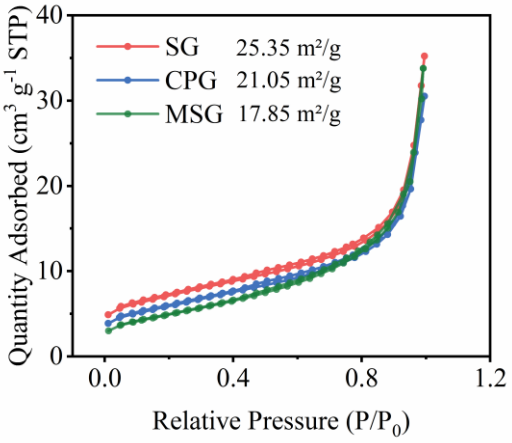

Fig. S3 N_2 adsorption and desorption curves of SG,CPG and MSG.

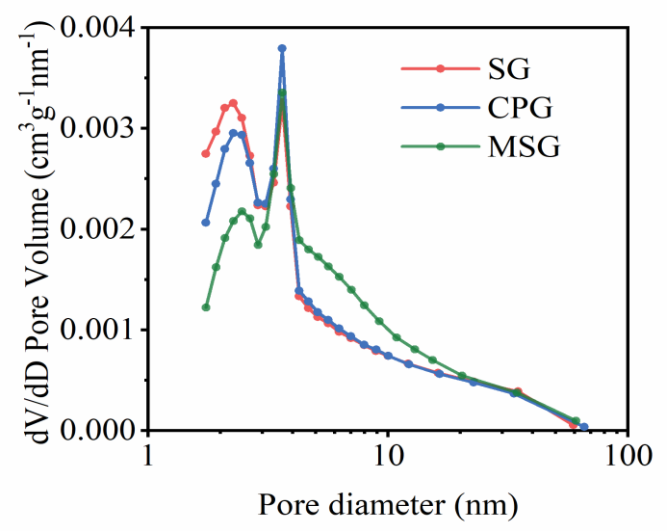

Fig. S4 Pore size distribution curves of SG,CPG and MSG.

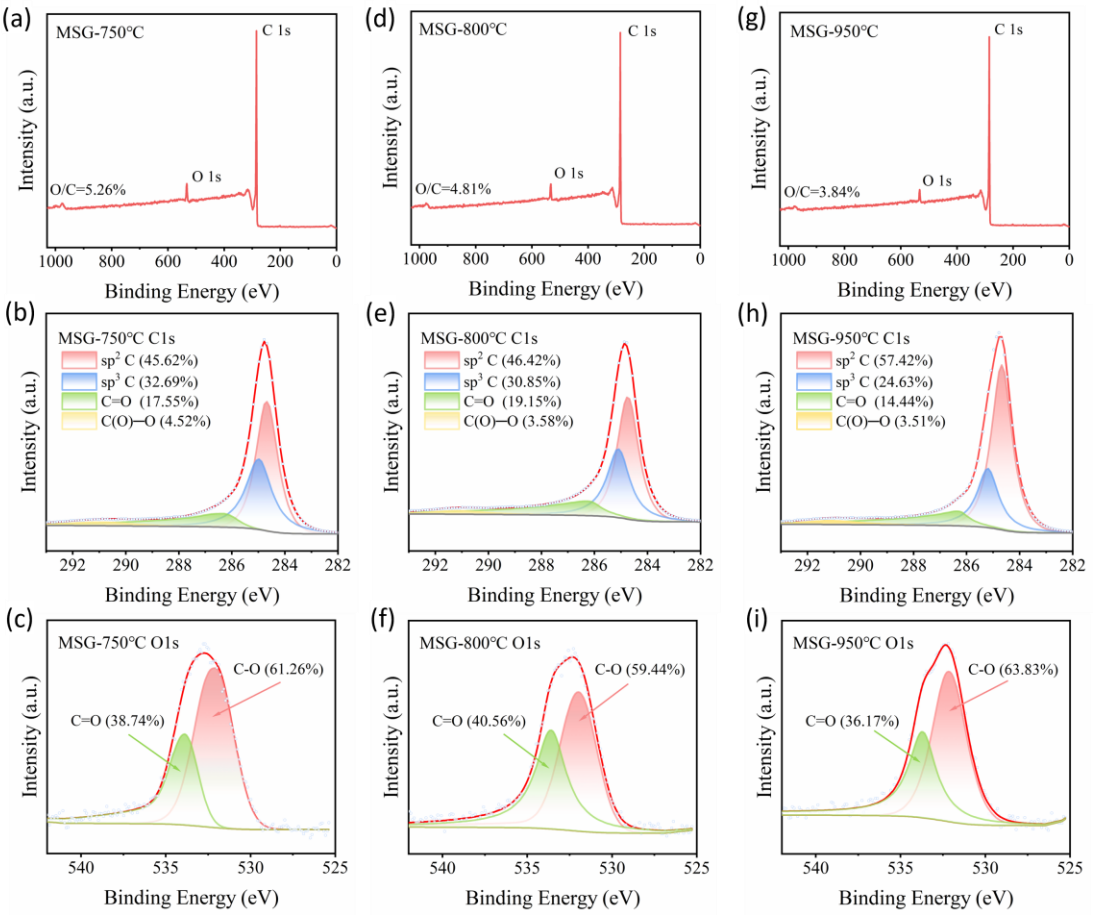

Fig. S5 Survey XPS and high-resolution C 1s and O 1s spectra for MSG-750 °C (a-c), MSG-800 °C (d-f) and MSG-950 °C (g-i).

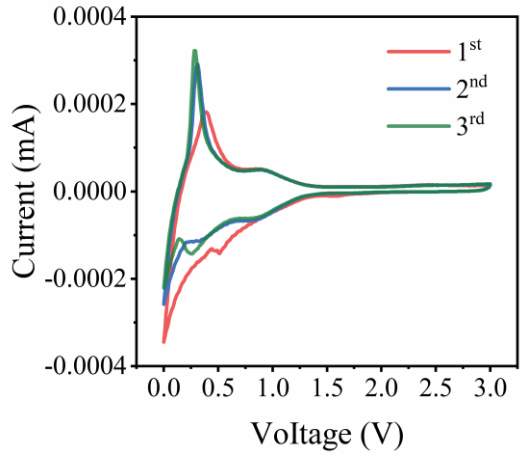

Fig. S6 Cyclic voltammetry curves from 1st to 3rd at 0.1 mV/s of SG.

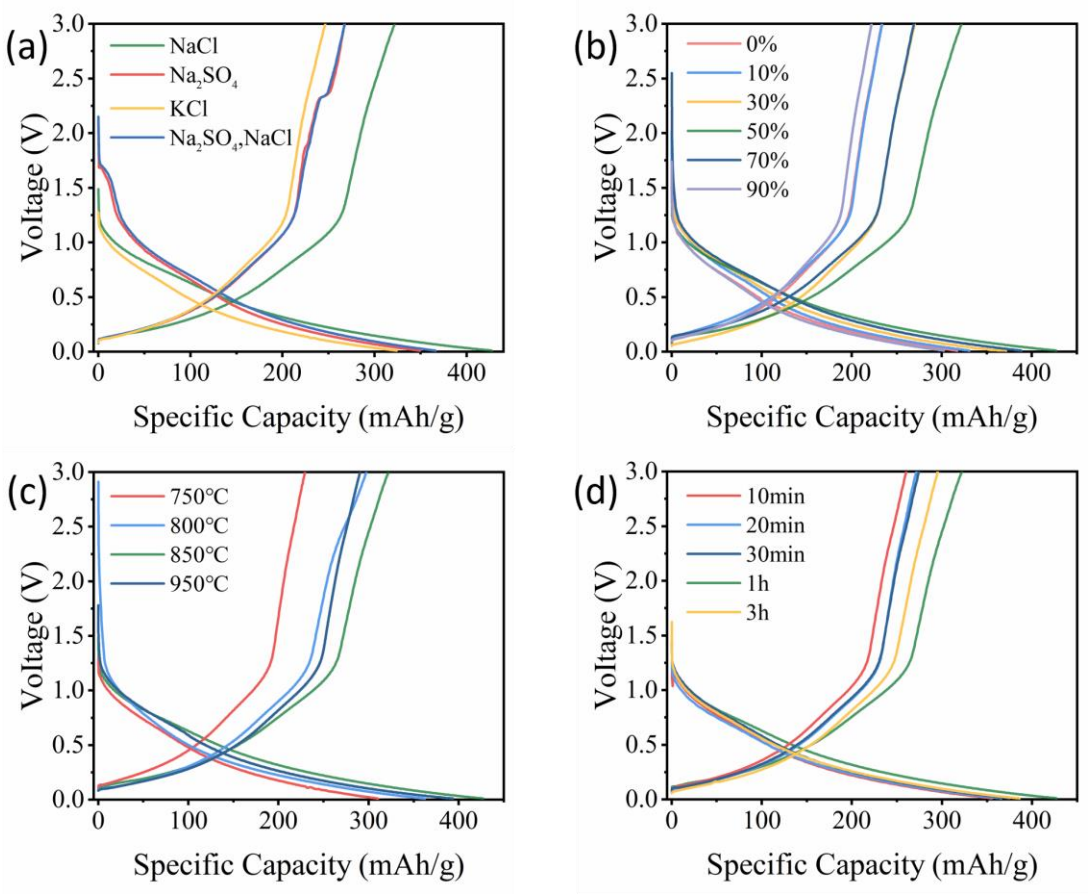

Fig. S7 Impact of different conditions on charge-discharge specific capacity: (a) types of inorganic salts (NaCl, Na_2SO_4, KCl, Na_2SO_4+NaCl), (b) proportion of inorganic salts, (c) temperature, (d) time.

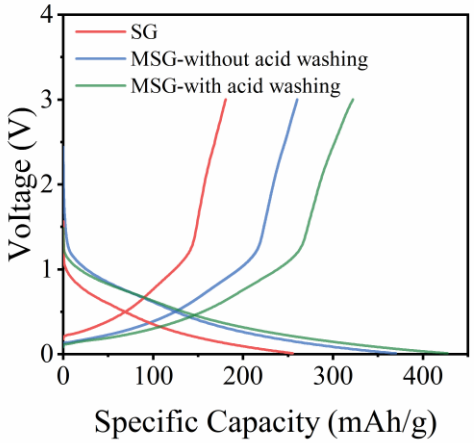

Fig. S8 The initial cycle charge–discharge profile of SG and MSG with/without acid washing.

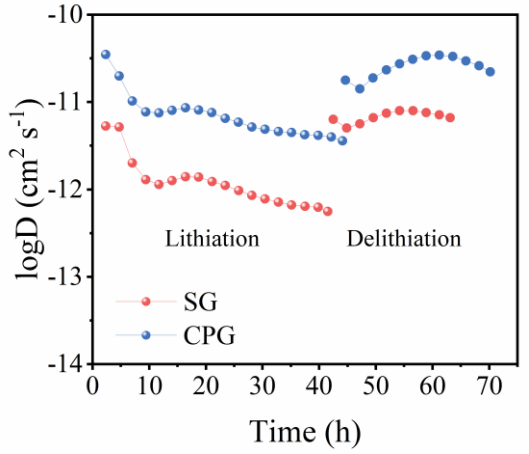

Fig. S9 Variation curve of Li^+ diffusion coefficient of SG and CPG with time.

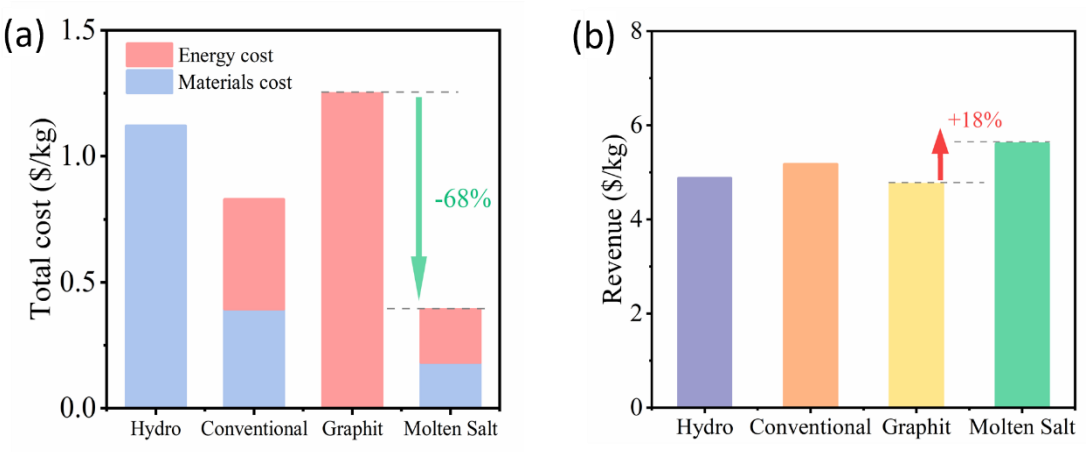

Fig. S10 (a) Total cost and (b) Revenue for regenerating 1 kg of graphite.

Table S1 ICP–OES test results of SG,CPG and MSG. (mg/kg)

Sample	Al	Fe	Li	Mn	Cu	Co	Ni	**Total content**
SG	337.58	170.64	1.12	2.91	0.96	5.18	3.27	**521.66**
CPG	23.67	70.97	0.34	6.98	0.33	0.39	2.21	**104.89**
MSG	30.81	49.80	0.22	1.46	0.44	0.03	1.52	**84.28**

Table S2 Electrochemical performance of regenerated graphite at high rates.

Sample	Method	Electrochemical performance	Ref.
B-Graphite	Boric acid leaching	140 mAh/g (1 C, 1st)	[1]
LG	Citric acid leaching	174 mAh/g (2 C, 1st)	[2]
RG	Roasting at 900 °C for 4 h	245.8mAh/g (1 C, 500th)	[3]
SCC	Roasting at 1600 °C for 1 h	235.0 mAh/g (1 C, 500th)	[4]
SCC	Roasting at 2600 °C for 0.5 h	263.0 mAh/g (1C, 300th)	[5]
PGC	Fluorination roasting at 200 °C for 1 h	140.2 mAh/g (1C, 100 th)	[6]
RG	Electrolysis method	125 mAh/g (2C, 100 th)	[7]
MSG	**Molten salt roasting at 850 °C for 1 h**	**201 mAh/g (2C, 1000 th)**	**This work**

Table S3 Total cost and metal recovery for recycling graphite.

Various methods	Materials cost ($/kg)	Energy cost ($/kg)	Total cost ($/kg)	Metal recovery (%)
Hydrometallurgy	1.12	0	1.12	99.9
Conventional method	0.394	0.435	0.829	79.9
Graphitization (2600-3300 °C)	0	1.249	1.249	0
Molten Salt	0.182	0.209	0.391	83.8

2. References

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