Supporting information

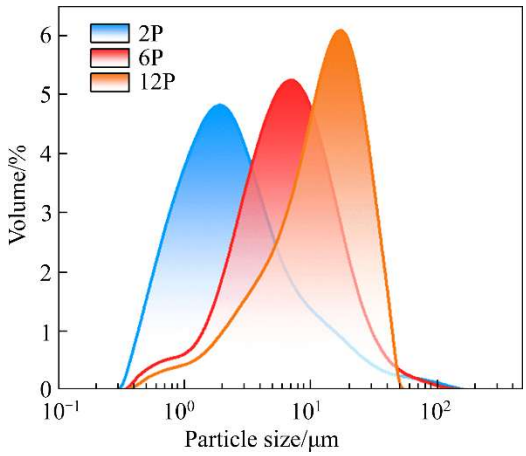

Figure S1 The particle size distribution of pitch for 2P, 6P and 12P used for 2P@SG, 6P@SG and 12P@SG

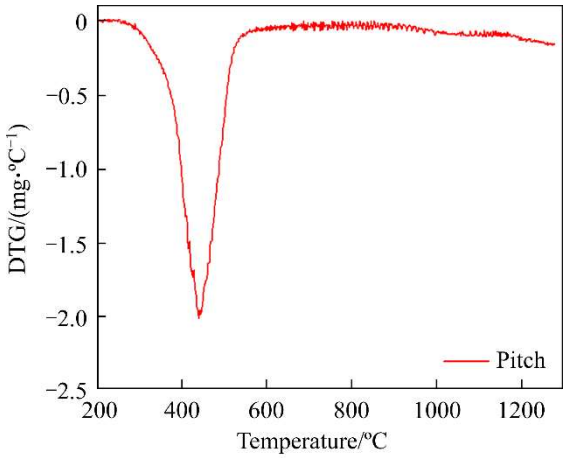

Figure S2 DTG analysis of pitch

Table S1 Specific surface area and average pore size measured by N_2 adsorption-desorption isotherms

Sample number	Specific surface area/($m^2 \cdot g^{-1}$)	BJH adsorption pore size/nm	BJH desorption pore size/nm
SG	8.4513	—	—
2P@SG	4.9116	28.5329	28.3082
6P@SG	5.5566	25.2298	24.7144
12P@SG	5.4376	25.5429	24.9960

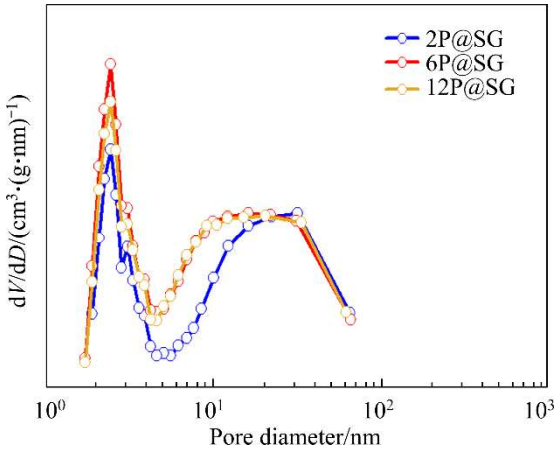

Figure S3 Pores size distributions of 2PE@SG, 6PE@SG and 12PE@SG

Table S2 Particle size distributions of modified graphite and SG

Sample number	D_{10}/μm	D_{50}/μm	D_{90}/μm
SG	6.6062	10.3373	15.1231
2P@SG	7.646	11.135	16.191
6P@SG	7.44	11.202	16.818
12P@SG	7.148	11.675	18.928

Table S3 Intensity of D and G peaks in Raman spectra and the value of I_D/I_G

Sample number	I_D	I_G	I_D/I_G
2P@SG	18.3	72.96	0.25
6P@SG	12.98	60.41	0.21
12P@SG	16.71	68.38	0.24

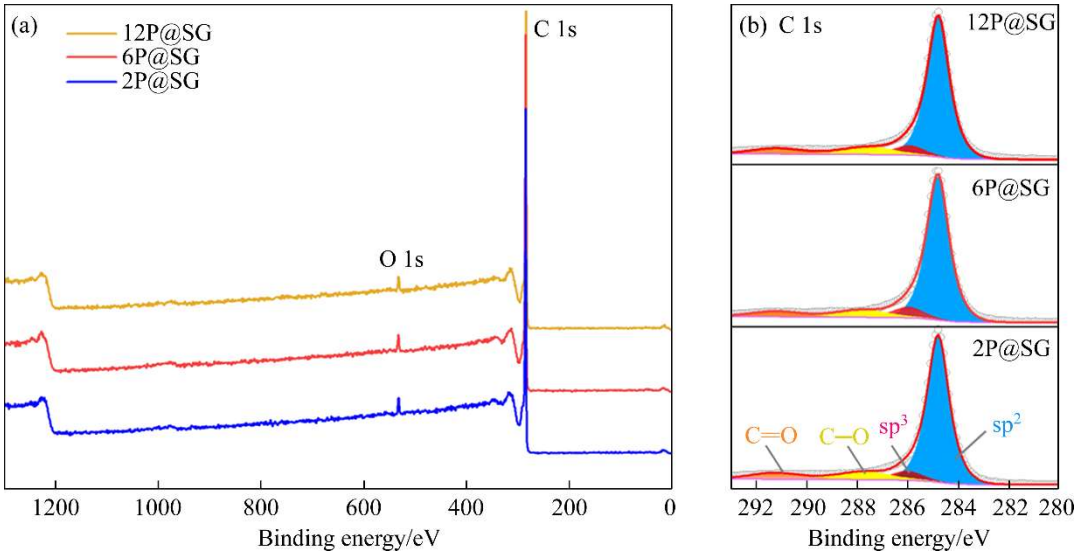

Figure S4 XPS spectra of 2P@SG, 6P@SG and 12P@SG

Table S4 Proportion of XPS peaks area

Sample number	sp^2/%	sp^3/%	C—O/%	C═O/%
2P@SG	77.70	6.28	8.88	7.14
6P@SG	77.90	7.51	8.37	6.22
12P@SG	77.54	7.06	8.62	6.78

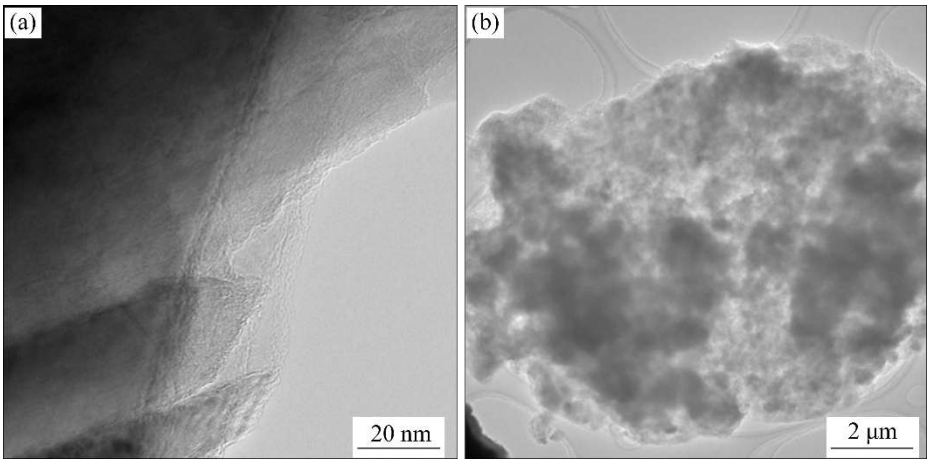

Figure S5 TEM images of 12P@SG

Table S5 Initial discharge-charge specific capacities and the initial coulombic efficiencies

Sample number	Initial charge capacity/ ($mA·h·g^{-1}$)	Initial discharge capacity/ ($mA·h·g^{-1}$)	Initial coulombic efficiency/%
SG	353.90	396.80	89.19
2P@SG	370.25	400.34	92.48
6P@SG	367.32	397.41	92.42
12P@SG	368.71	404.57	91.13

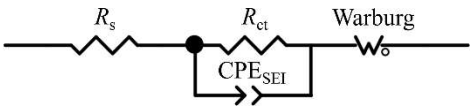

Figure S6 Equivalent circuit diagram of EIS fitting

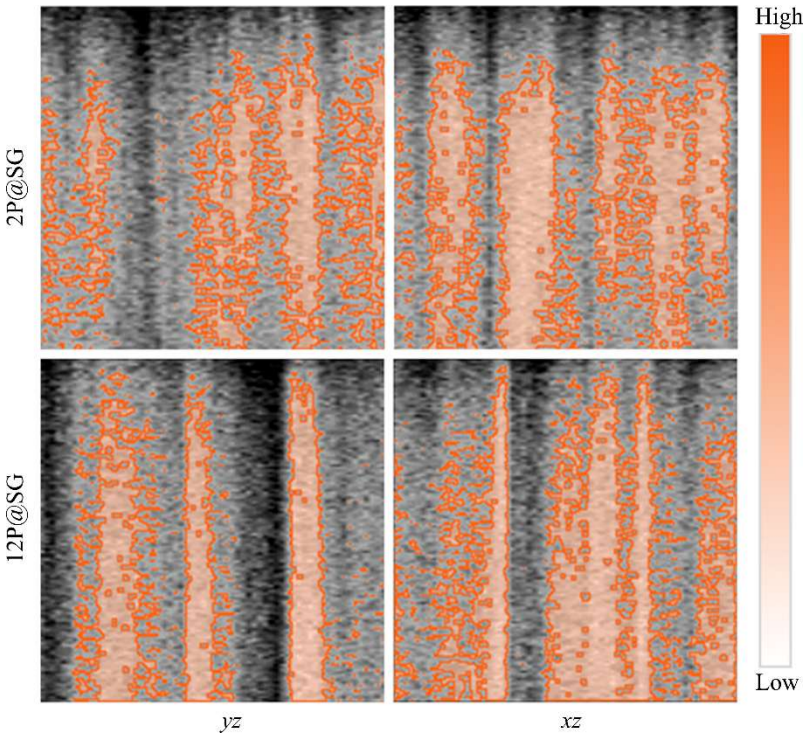

Figure S7 Sectional drawing of 3D rendering of LiF in *yz* plane (center) and *xz* plane (center) respectively