Supporting Information

Effect of mesophase pitch incorporation on ablation behavior and mechanism of phenolic composites

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Table. S1. Compositions of samples

Sample	Phenolic resin (wt.%)	Mesophase pitch (wt.%)
BPR	100	0
$MPBPR_5$	95	5
$MPBPR_{10}$	90	10
$MPBPR_{20}$	80	20

Table. S2. Parameters of the oxyacetylene torch for ablation test

Heat Flux (MW/m^2) ±10%	Ablation angle (°)	Ablation distance (mm)	Ablation time (s)	Flux (mL/min)		O_2/ C_2H_2	Pressure (MPa)	
				O_2	C_2H_2	Ratio (%)	O_2	C_2H_2
4.1868	90	10	30	25200	18600	1.35	0.4	0.095

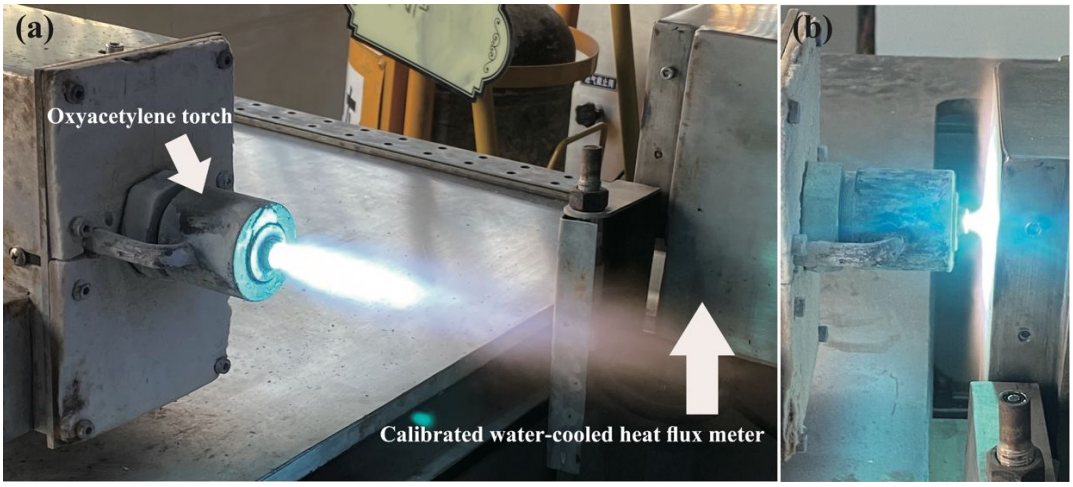

Figure. S1. Photographs of (a) oxyacetylene torch and calibrated water-cooled heat flux meter, (b) measurement of heat flux before the exposure of specimen

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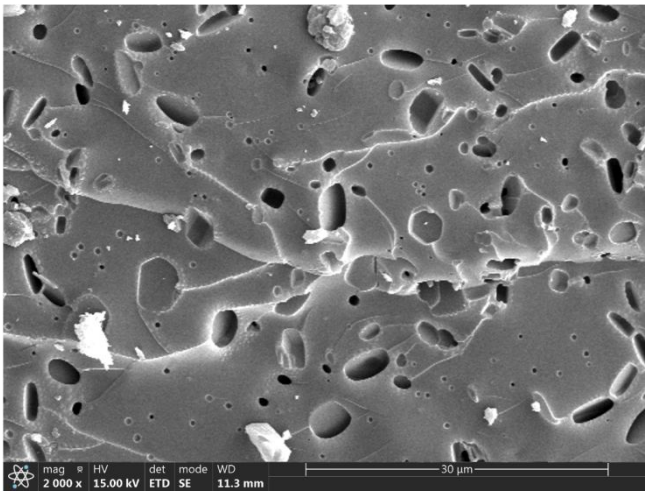

Figure. S2. SEM image of the fracture section of the pyrolysis carbon for BPR

As shown in Fig.S2, the typical brittle fracture surface of glassy carbon for pure phenolic is clearly observed. The fracture morphology of the glassy carbon is very smooth, continuous and isotropic, which contains a large number of pores deriving from the release of the pyrolysis gas.

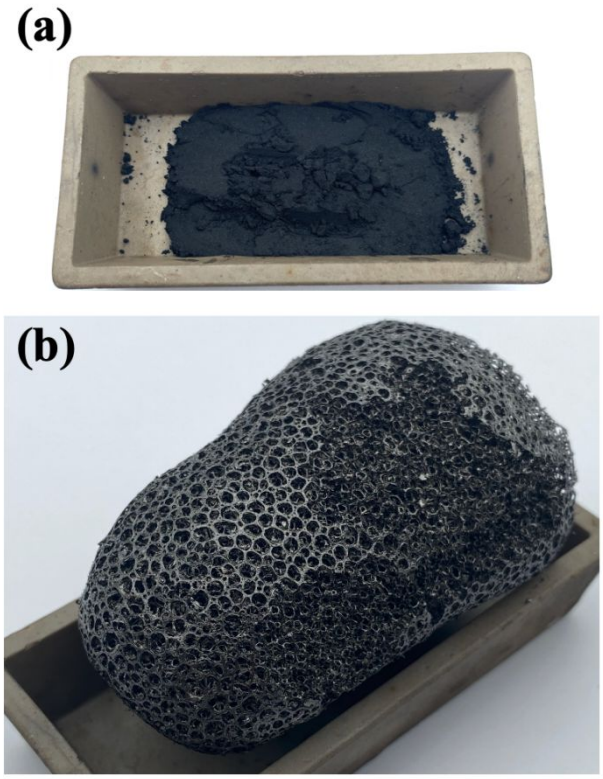

Figure. S3. Optical image of the MP (a) before, (b) after carbonization at 1100°C in a tubular furnace with a heating rate of 5°C/min and dwelling for 1h in a argon atmosphere

As shown in Fig. S3, mesophase pitch itself suffers severe swelling to produce

very porous carbons during carbonization.