

Supplementary Information

Polyoxometalate Modified Pine Cone Biochar Carbon for Supercapacitor Electrodes

Matthew Genovese and Keryn Lian

Table S1: Average mass loading of each electrode sample tested

<i>Sample</i>	<i>Average Electrode Mass Loading (mg cm⁻²)</i>
PC 2-1	1.80
PC 4-1	1.76
PC 5-1	1.75
PC 2-1-PMo ₁₂	2.59
PC 4-1-PMo ₁₂	2.80
PC 5-1-PMo ₁₂	3.38
PC 5-1-PMo ₁₂ -PW ₁₂	3.33

Table S2: Surface chemical composition of bare and PMo₁₂ modified PC Carbon samples determined by XPS analysis

	<i>C (At. %)</i>	<i>O (At. %)</i>	<i>Mo (At. %)</i>
<i>PC 2-1</i>	93.7	6.3	--
<i>PC 4-1</i>	93.8	6.2	--
<i>PC 5-1</i>	95.0	5.0	--
<i>PC 2-1-PMo₁₂</i>	85.5	13.1	1.4
<i>PC 4-1-PMo₁₂</i>	82.1	15.0	2.9
<i>PC 5-1-PMo₁₂</i>	69.9	17.3	5.8

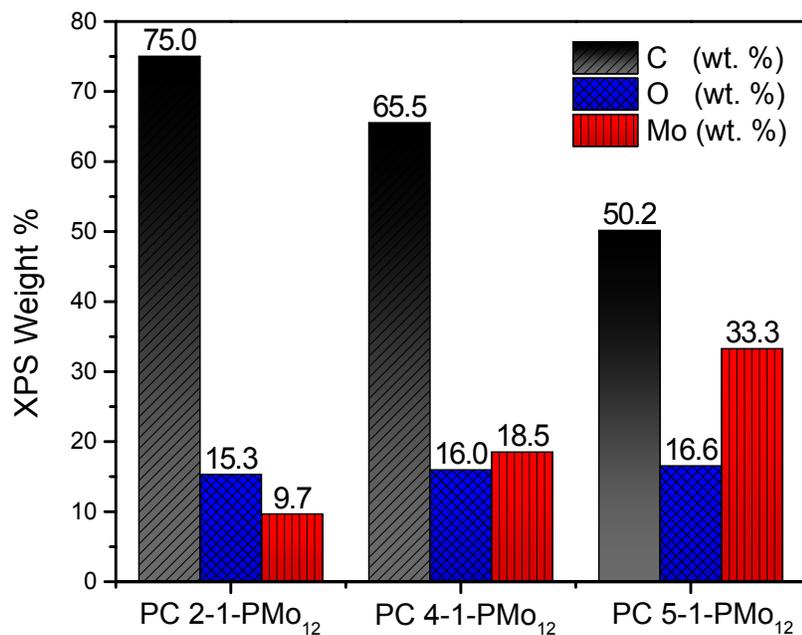


Figure S1: XPS surface chemical composition of PMo₁₂ modified PC Carbon in terms of weight %

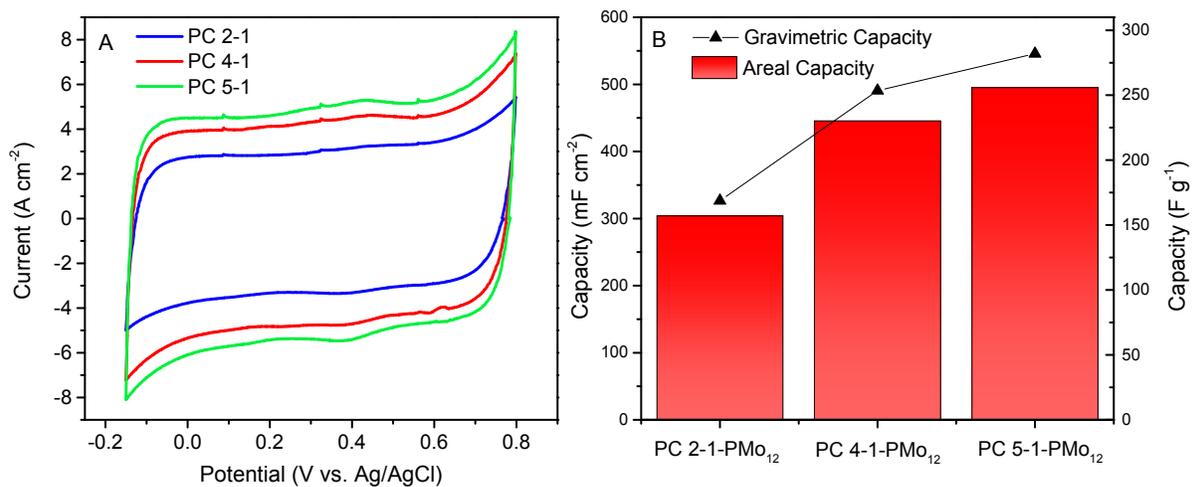


Figure S2: (A) Cyclic Voltammograms (CVs) of the unmodified PC 2-1, PC 4-1, and PC 5-1 carbon substrates at 10 mV s⁻¹; (B) capacitance of the PC carbon substrates at 10 mV s⁻¹ in terms of both areal (primary axis) and gravimetric (secondary axis) values.

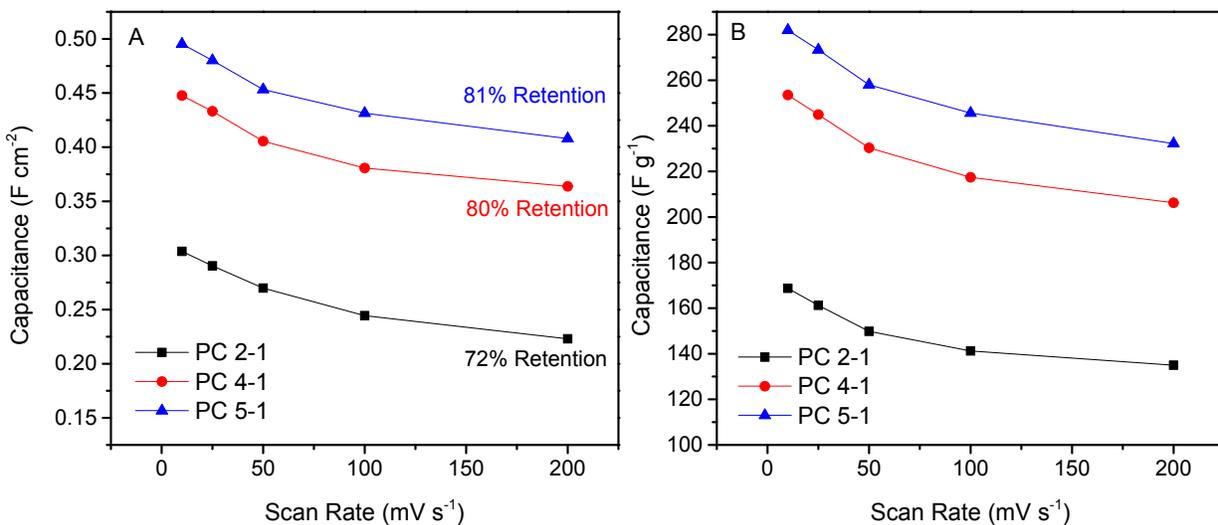


Figure S3: (A) Areal and (B) gravimetric capacitance vs. scan rate for the unmodified PC 2-1, PC 4-1, and PC 5-1 substrates.

Scheme S1:

Proton coupled electron transfer for PMo_{12} in acidic aqueous solutions:¹



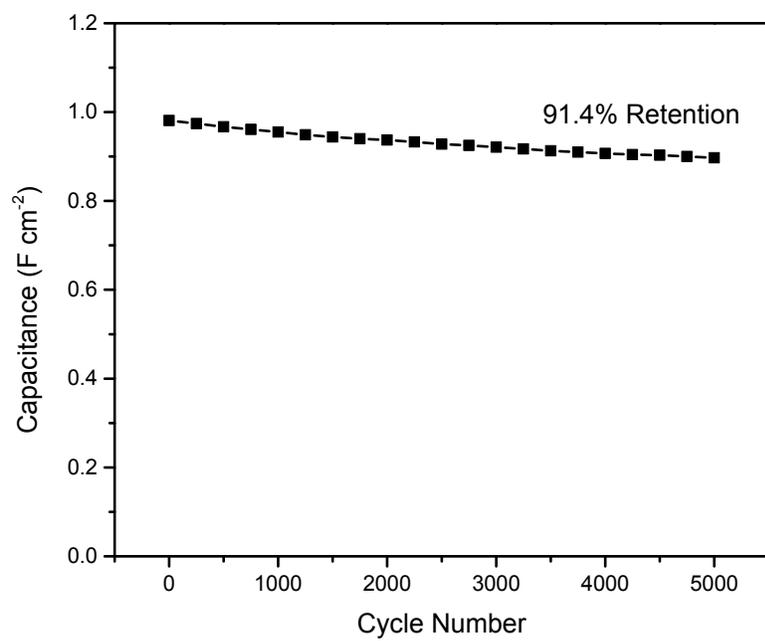


Figure S4: Capacity retention of PC 5-1-PMo₁₂ electrode after 5000 successive cycles at 50 mV s⁻¹

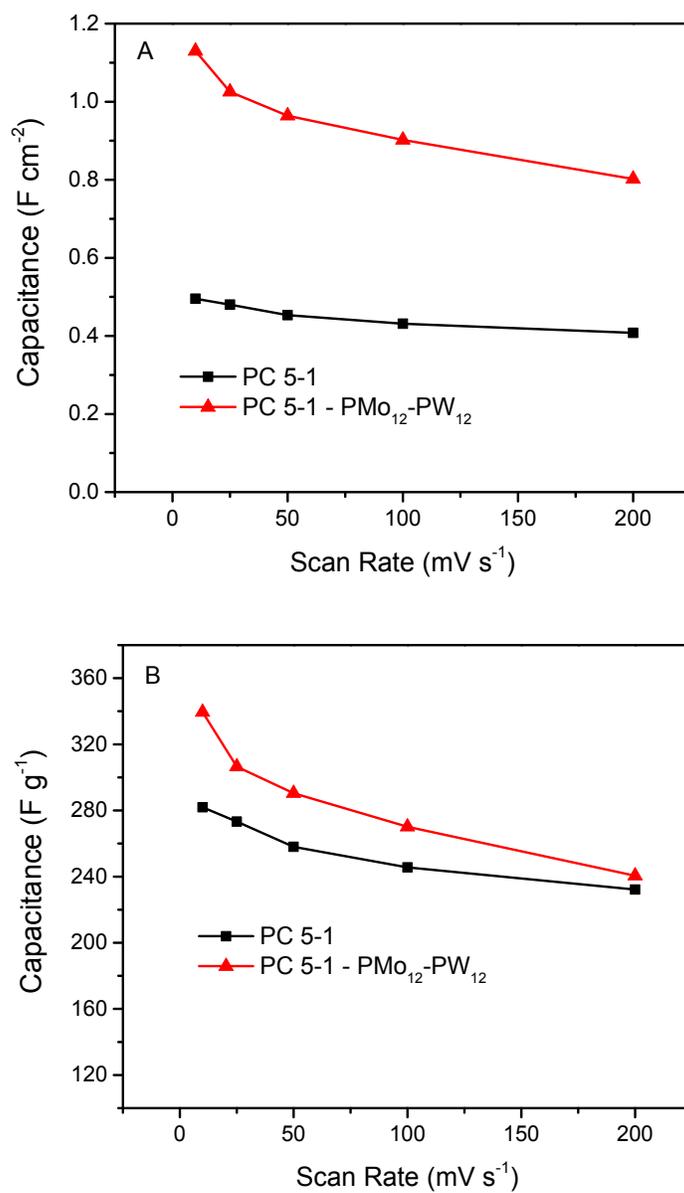


Figure S5: (A) Areal and (B) gravimetric capacitance of the bare and PMo₁₂-PW₁₂ modified PC 5-1 substrate as a function of scan rate.

References

1. M. Sadakane and E. Steckhan, *Chemical Reviews*, 1998, **98**, 219-238.