Supporting Information:

The Solid Electrolyte Interphase (SEI) of Water-Processed Graphite Electrodes Examined in a 65 mAh Full Cell Configuration

F. Jeschull[1,†,], J. Maibach[1,‡], R. Félix[2], M. Wohlfahrt-Mehrens[3], K. Edström[1], M. Memm[3], D. Brandell[1]*

[1]*Department of Chemistry – Ångström Laboratory, Uppsala University, Lägerhyddsvägen 1, 75121 Uppsala, Sweden*

[2]*Renewable Energy, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin, Germany*

[3]*Zentrum für Solarenergie- und Wasserstoff-Forschung (ZSW), Lise-Meitner-Straße 24, 89081 Ulm, Germany*

1. Galvanostatic Cycling of Samples

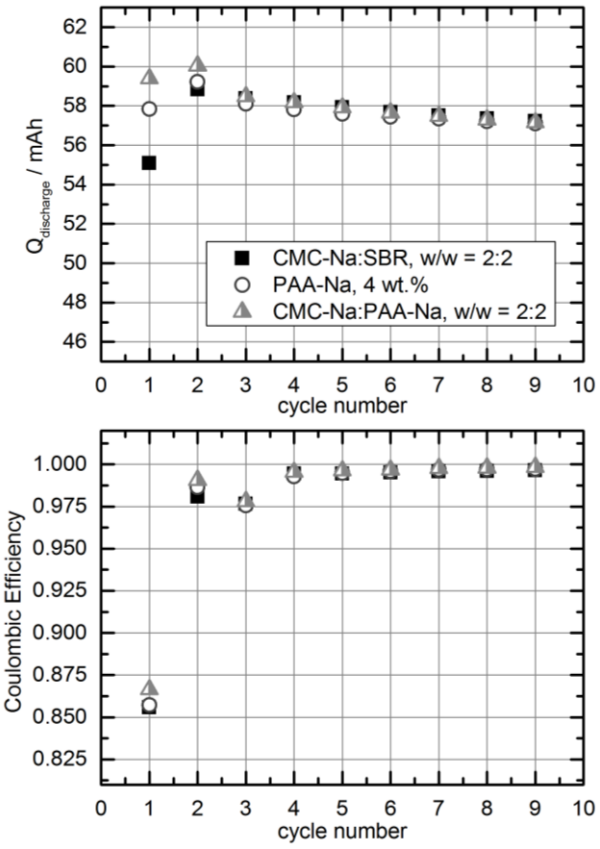

Figure S1. Discharge capacities (top) and corresponding Coulombic efficiencies (bottom) of graphite:$LiFePO_4$ lithium-ion batteries. The graphite electrodes contained 4 wt.% of PAA-Na binder (empty circles) or a binder blend of CMC-Na:SBR (2:2, filled squares) and CMC-Na:PAA-Na (2:2, triangles), respectively.

2. Relative atomic ratios (supplement to Fig. 4)

Table S1. Relative atomic concentrations in pristine, soaked and cycled electrodes in either of the three formulations.

CMC:SBR

element	pristine	soaked	cycled
C	86.7	74.8	43.7
O	11.9	10.0	20.6
F	0.0	9.3	14.3
P	0.0	1.0	2.1
Na	1.3	0.2	0.0
Li	0.0	4.8	19.3

PAA-Na

element	pristine	soaked	cycled
C	90.0	83.8	33.5
O	7.8	5.7	26.0
F	0.0	6.1	12.9
P	0.0	0.6	2.7
Na	2.2	0.1	0.6
Li	0.0	3.7	24.3

CMC:PAA

element	pristine	soaked	cycled
C	81.8	76.1	22.5
O	15.5	11.9	13.3
F	0.0	7.1	30.6
P	0.0	1.1	1.9
Na	2.7	0.2	0.4
Li	0.0	3.6	31.3

3. Survey Spectra of Cycled Samples

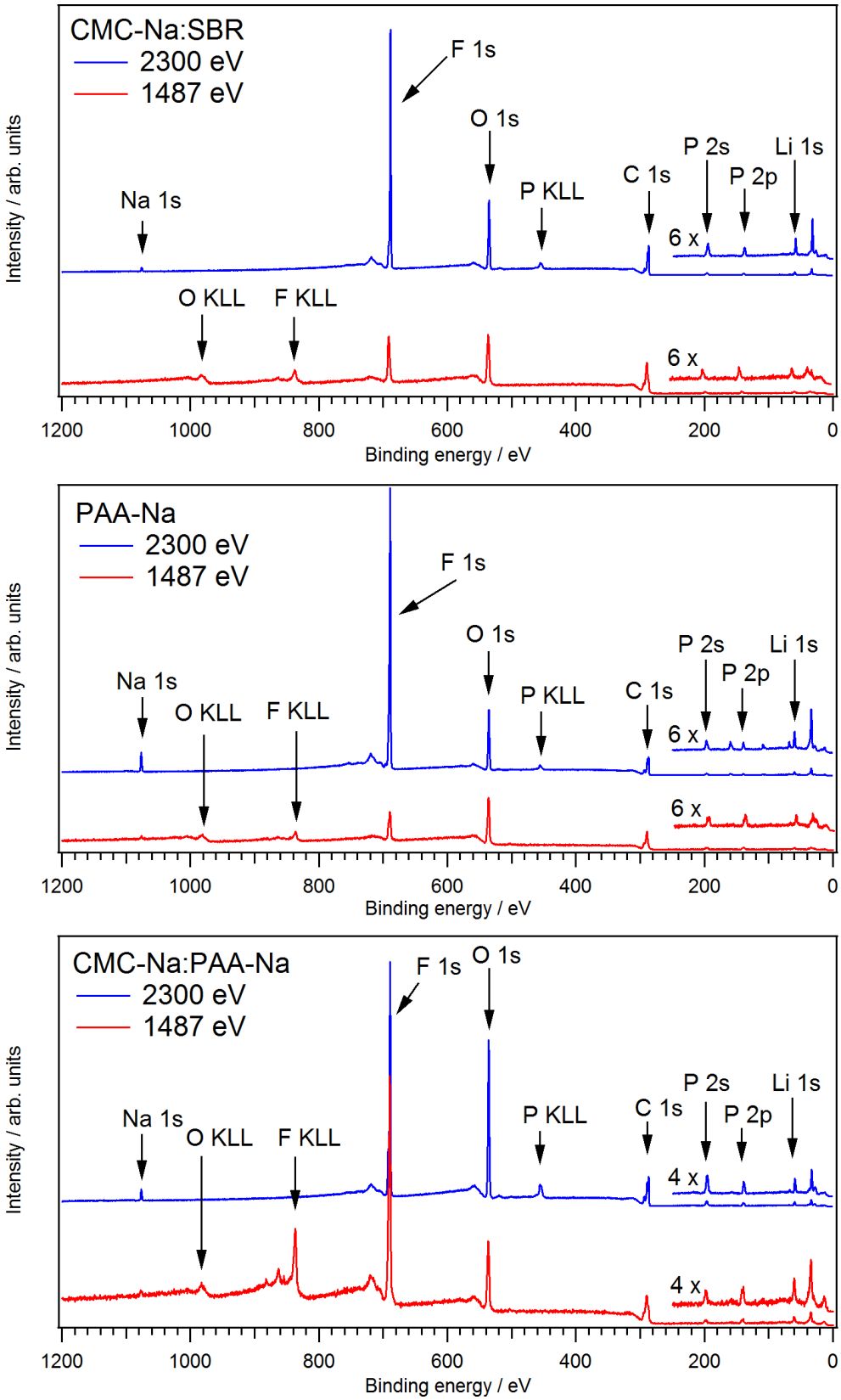

Figure S2. Survey spectra of the cycled graphite electrodes measured using excitation energies of 1487 eV and 2300 eV

3. Core level spectra of pristine, soaked and cycled samples

3.1. Comparison: SMG-A3 graphite (powder vs. pristine graphite electrode with CMC:SBR binder)

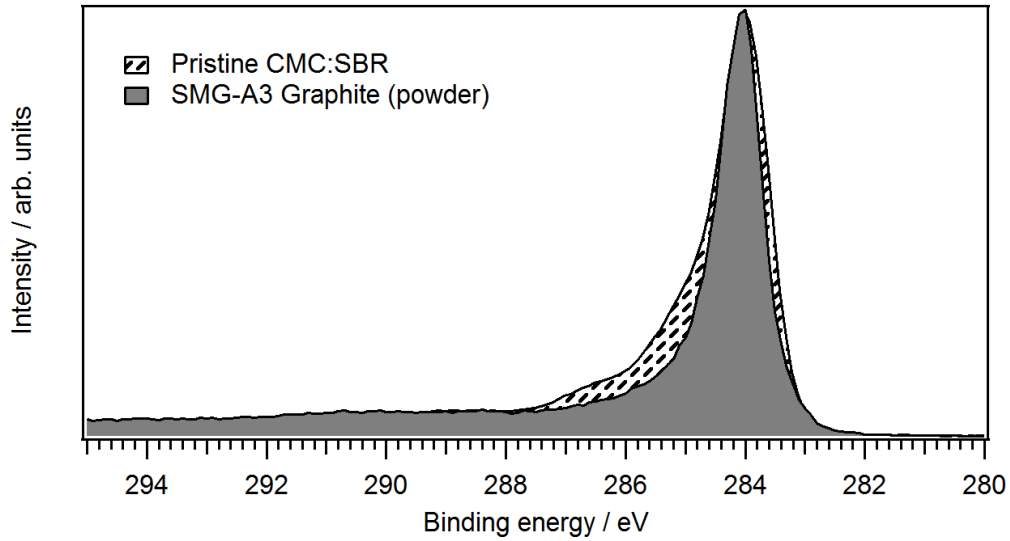

Figure S3. C 1s spectra of soaked and cycled samples of the CMC:SBR electrode formulation.

3.2. PES spectra of CMC-Na:SBR electrodes

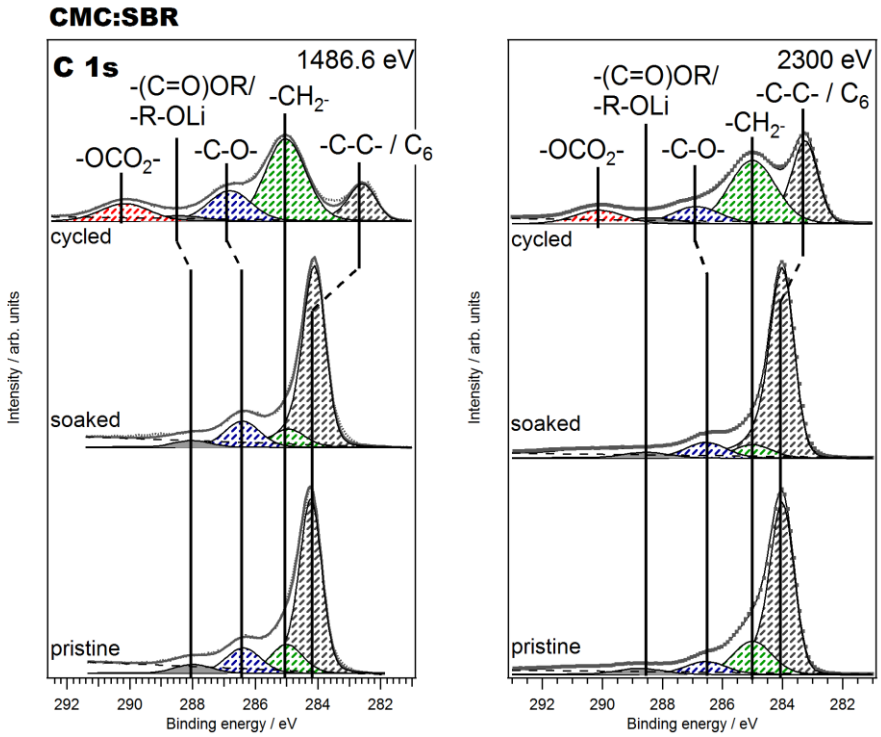

Figure S4. C 1s spectra of pristine, soaked and cycled samples of the CMC:SBR electrode formulation.

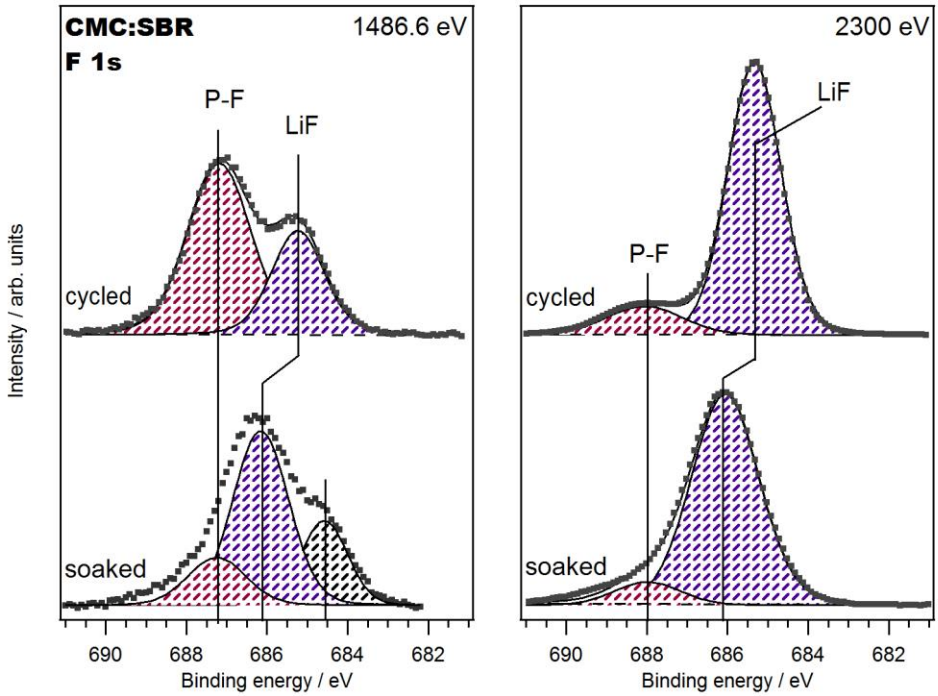

Figure S5. F 1s spectra of soaked and cycled samples of the CMC:SBR electrode formulation.

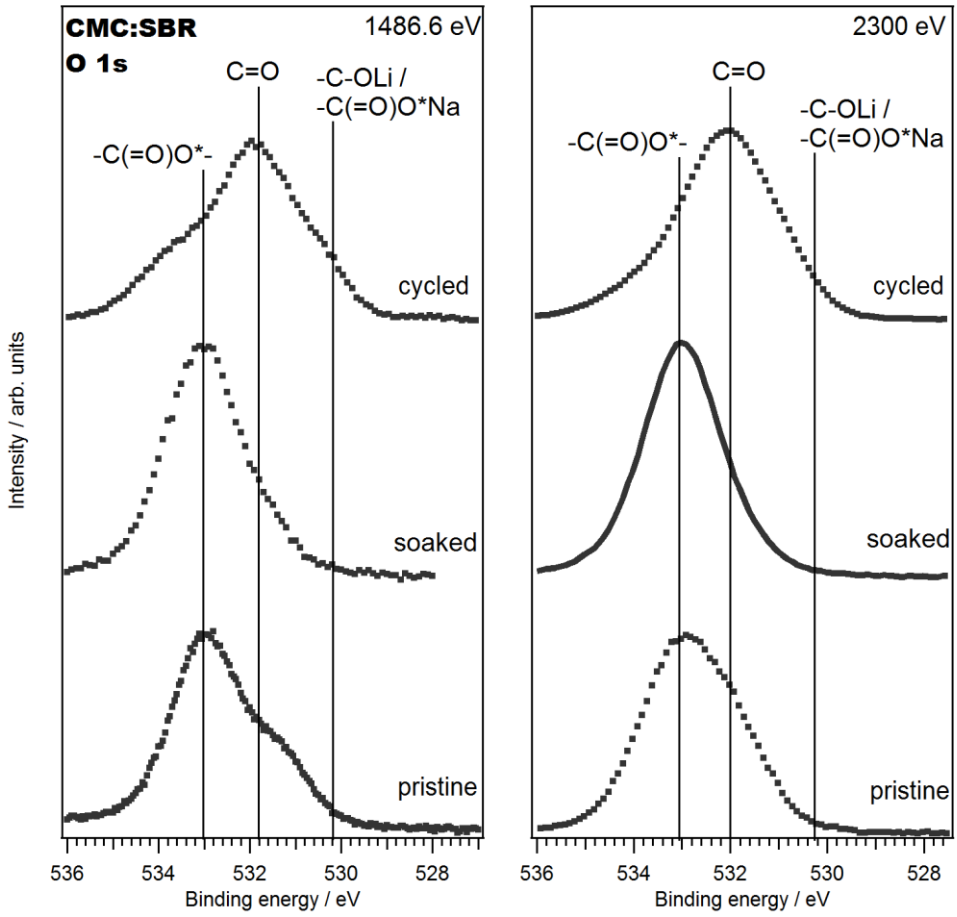

Figure S6. O 1s spectra of pristine, soaked and cycled samples of the CMC:SBR electrode formulation.

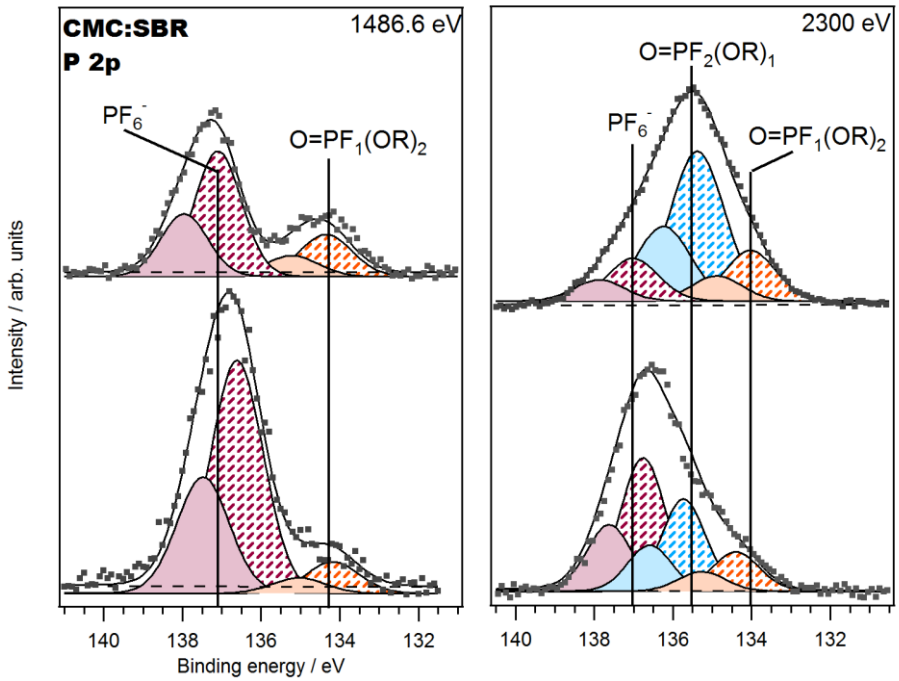

Figure S7. P 2p spectra of soaked and cycled samples of the CMC:SBR electrode formulation.

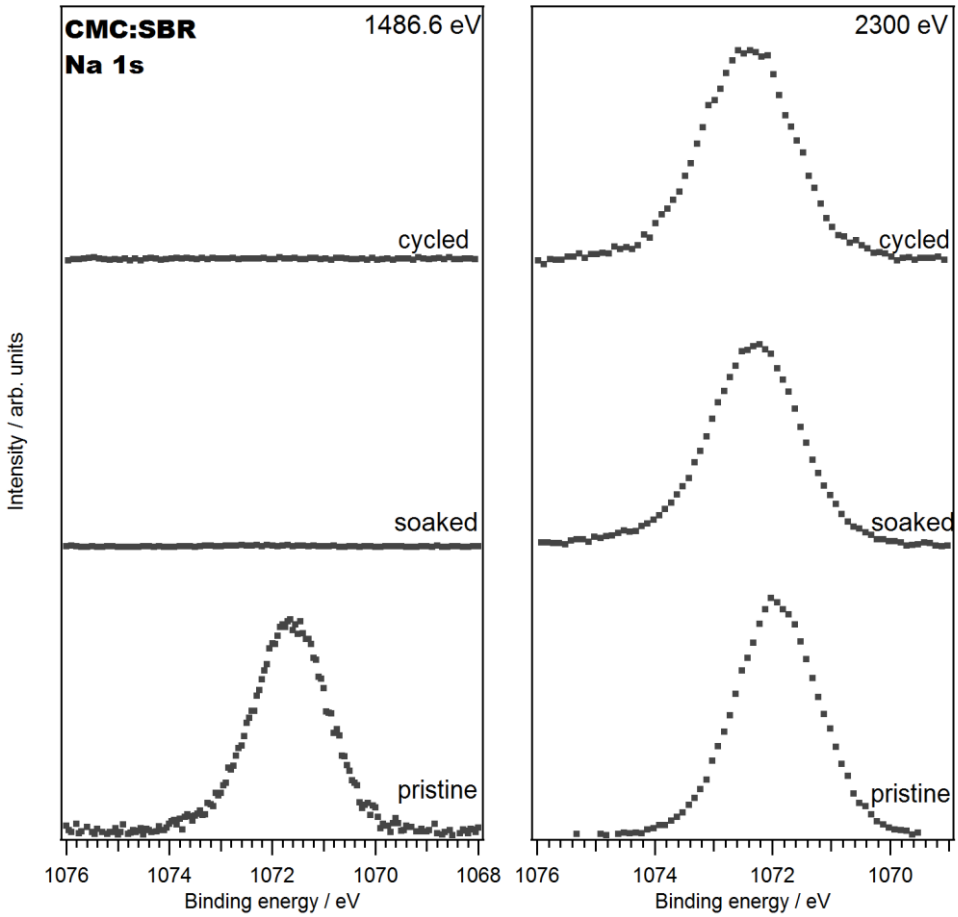

Figure S8. Na 1s spectra of pristine, soaked and cycled samples of the CMC:SBR electrode formulation.

3.3. PES spectra of PAA-Na electrodes

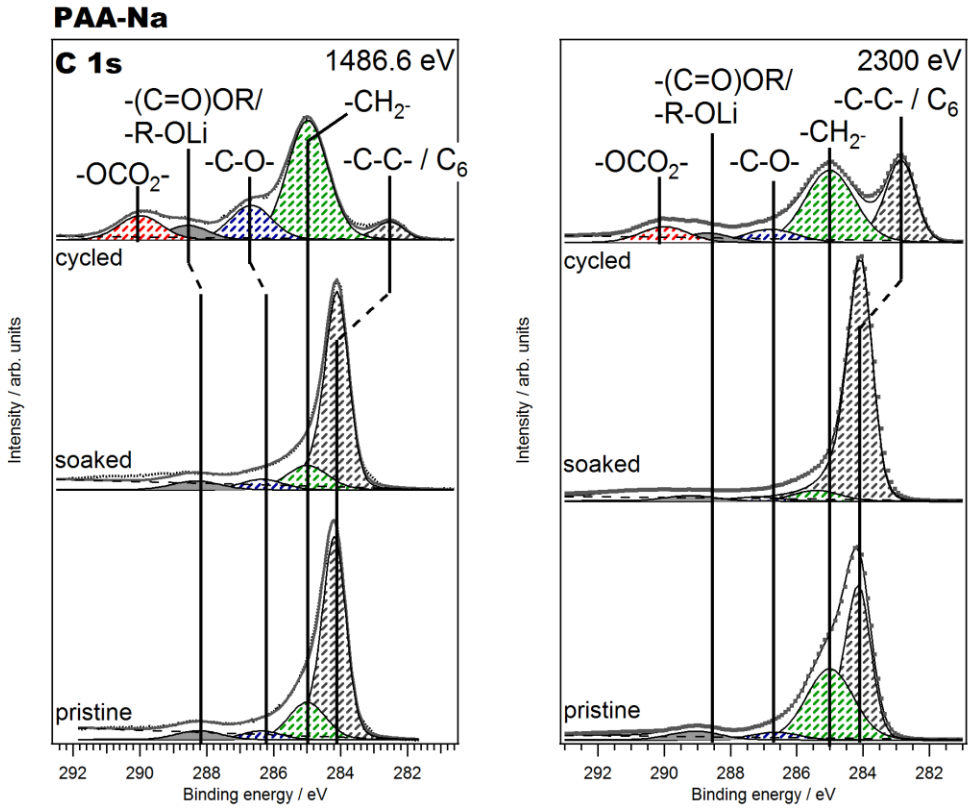

Figure S9. C 1s spectra of pristine, soaked and cycled samples of the PAA-Na electrode formulation.

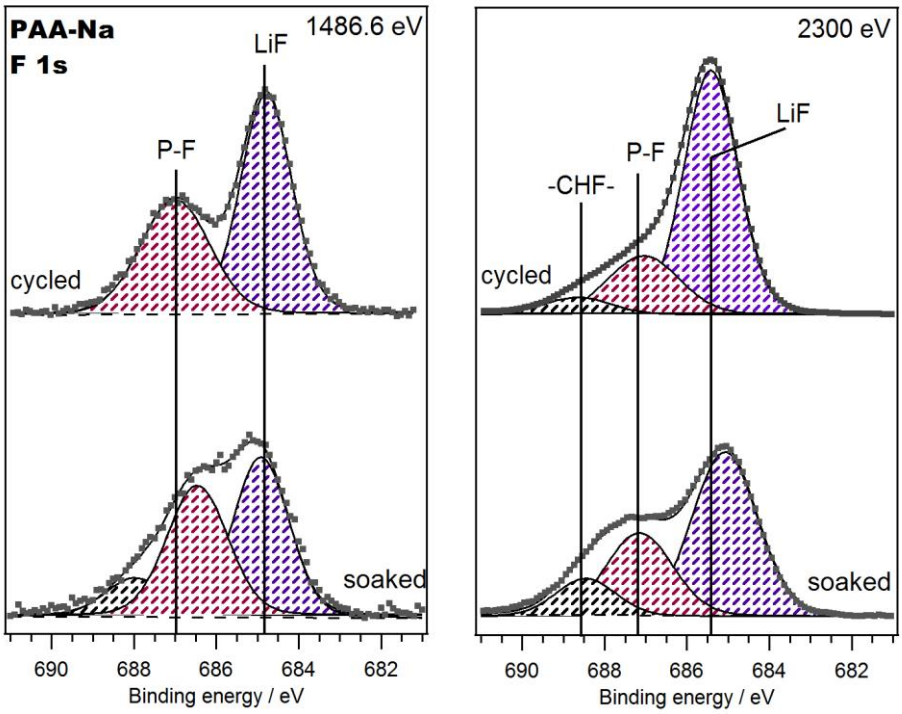

Figure S10. F 1s spectra of soaked and cycled samples of the PAA-Na electrode formulation.

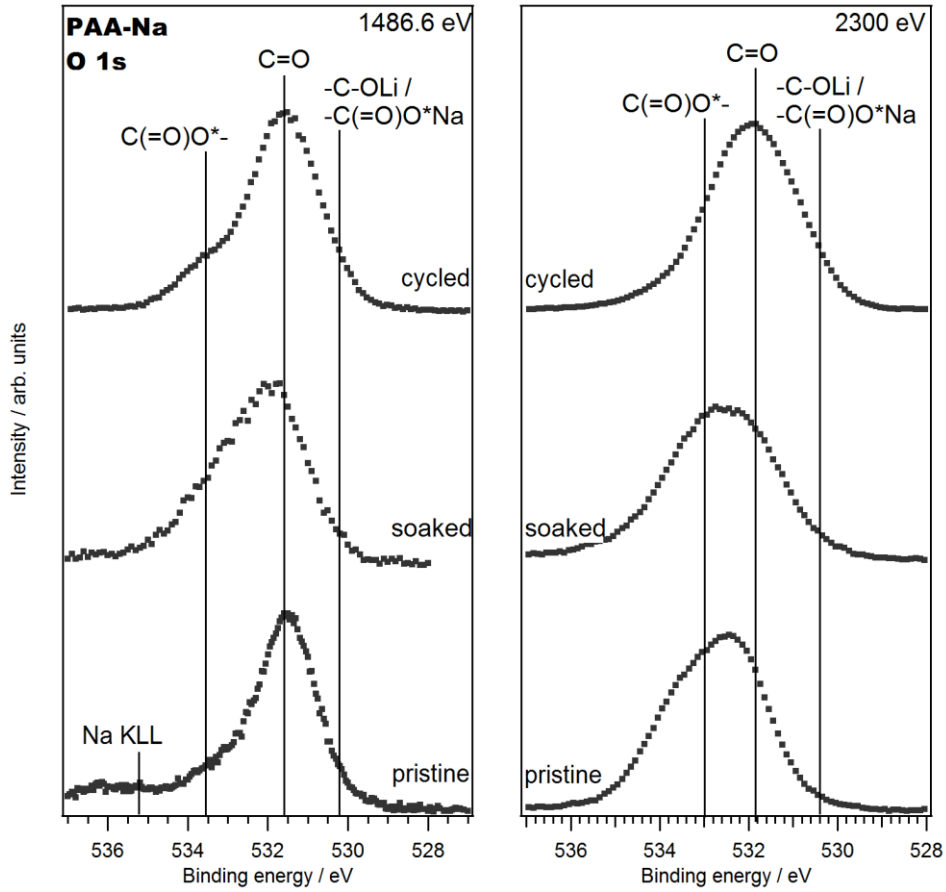

Figure S11. O 1s spectra of pristine, soaked and cycled samples of the PAA-Na electrode formulation.

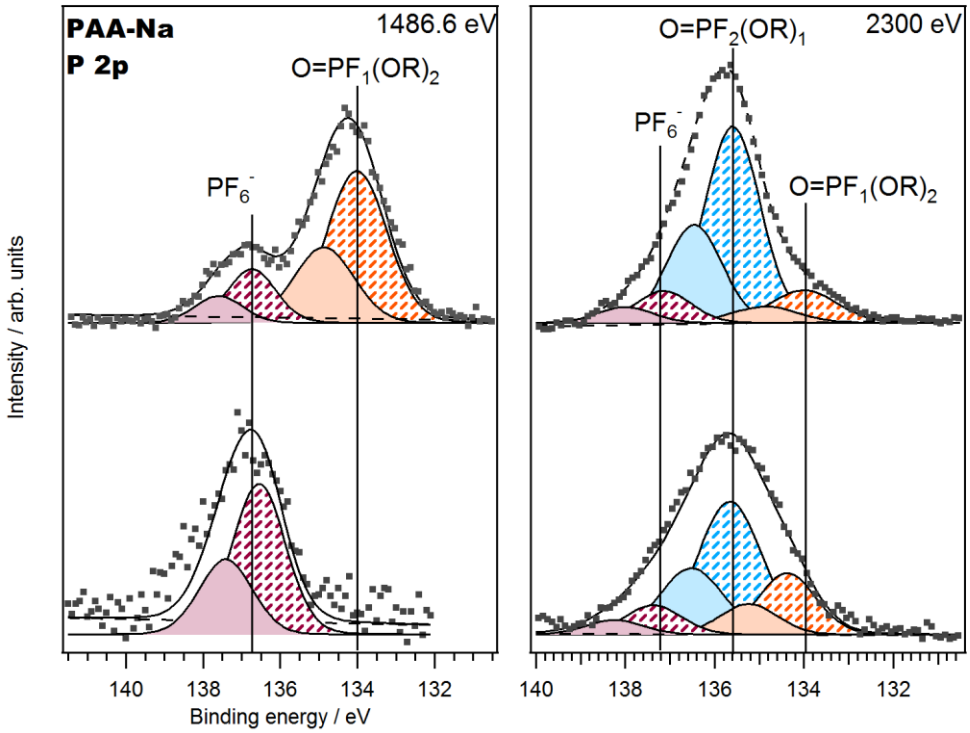

Figure S12. P 2p spectra of soaked and cycled samples of the PAA-Na electrode formulation.

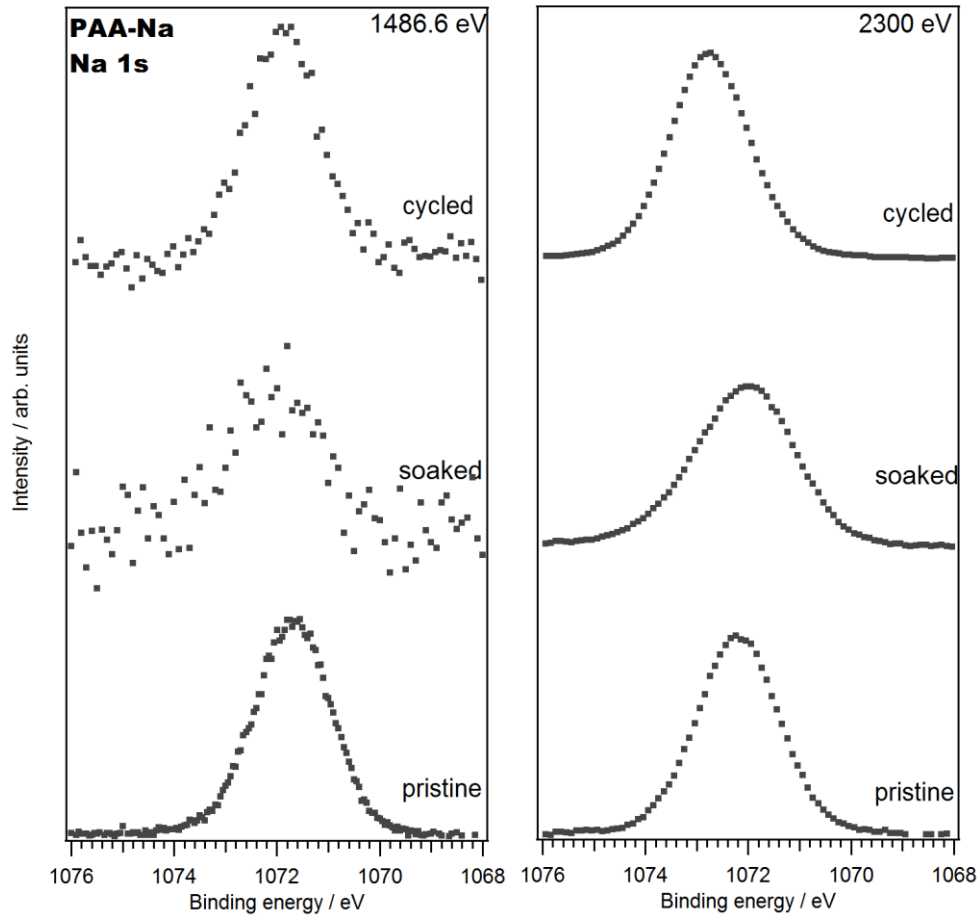

Figure S13. Na 1s spectra of pristine, soaked and cycled sample of the PAA-Na electrode formulation.

3.4. PES spectra of CMC:PAA electrodes

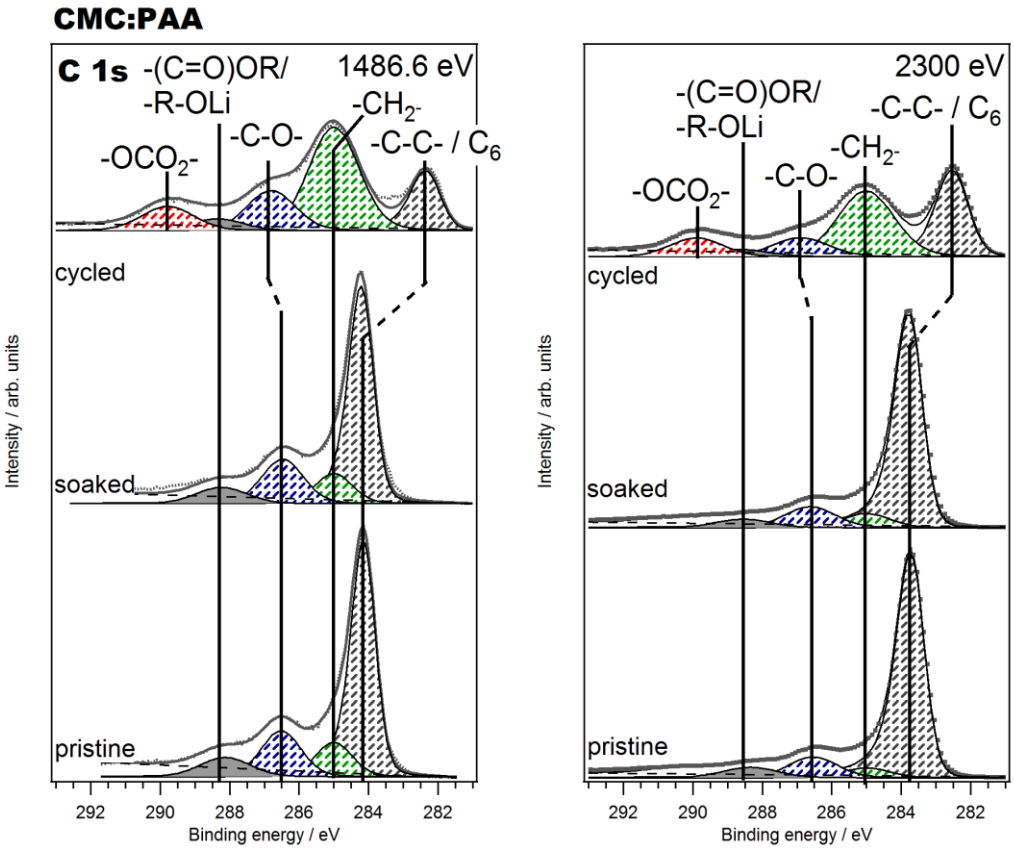

Figure S14. C 1s spectra of pristine, soaked and cycled samples of the CMC:PAA electrode formulation.

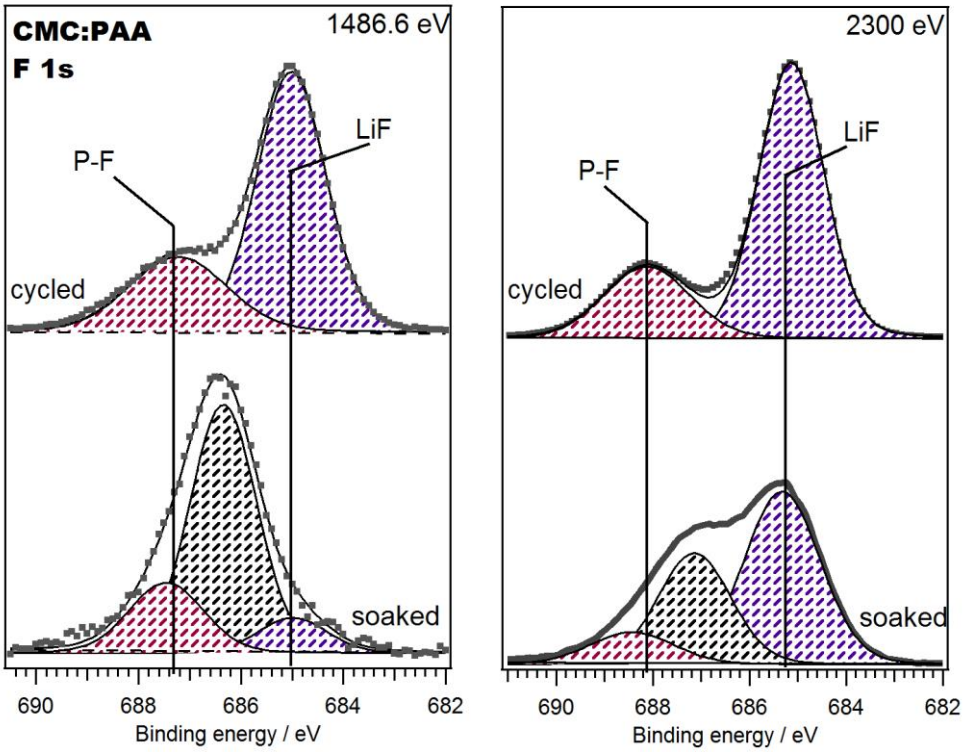

Figure S15. F 1s spectra of soaked and cycled samples of the CMC:PAA electrode formulation.

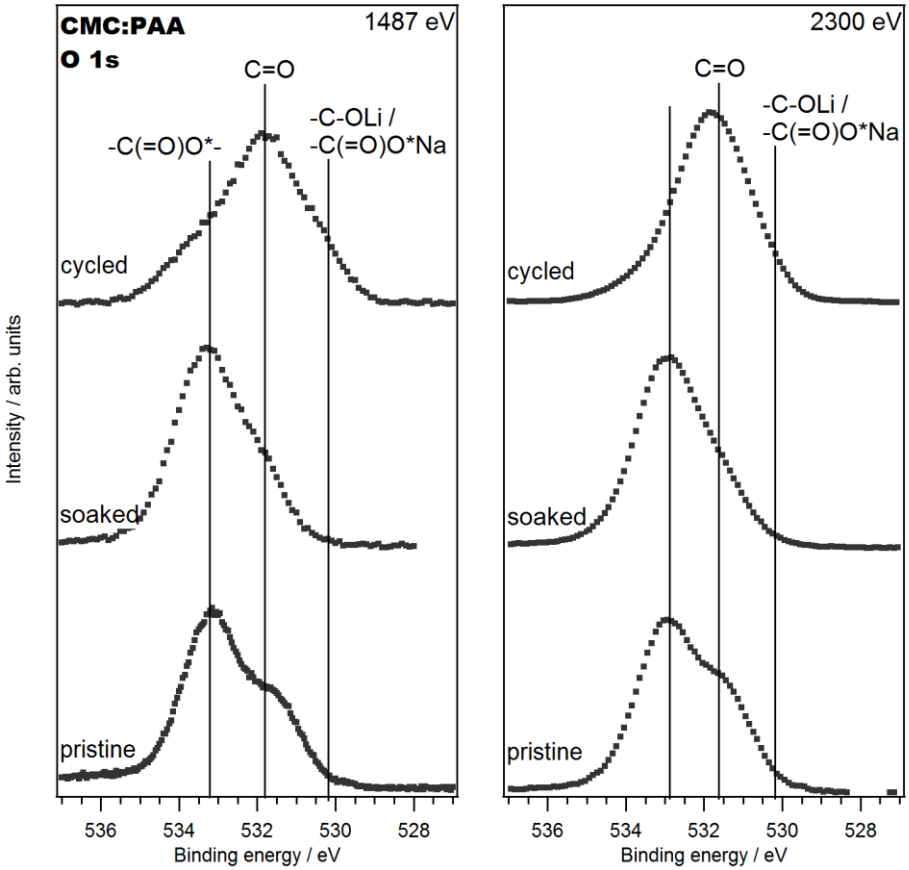

Figure S16. O 1s spectra of pristine, soaked and cycled samples of the CMC:PAA electrode formulation.

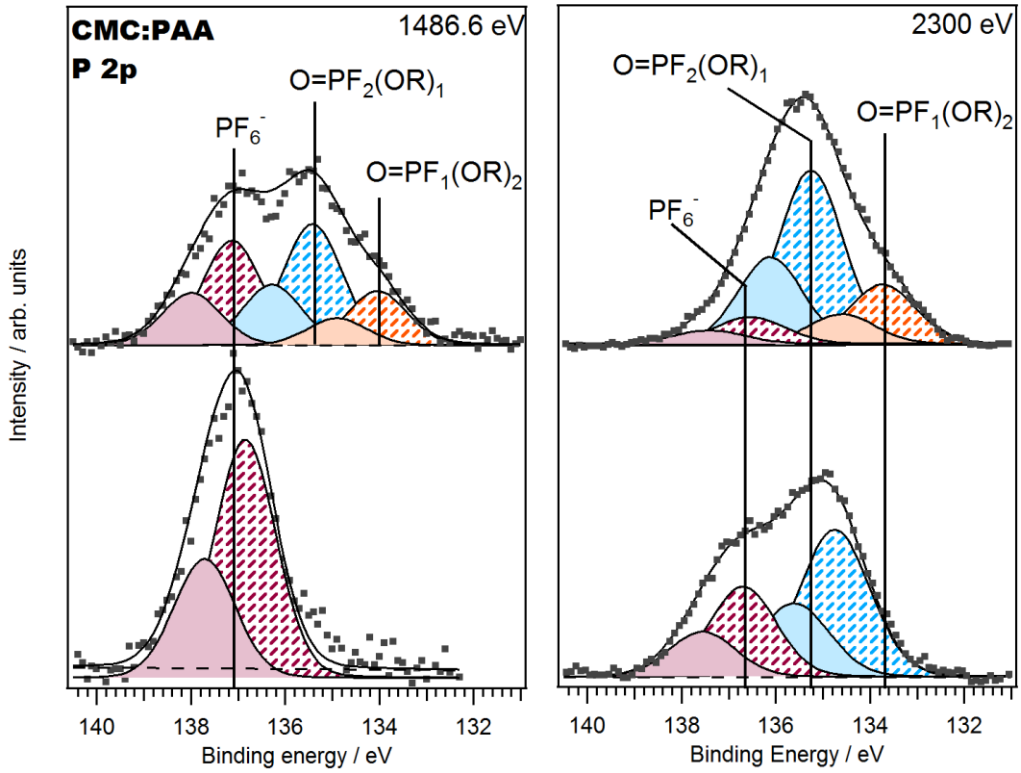

Figure S17. P 2p spectra of soaked and cycled samples of the CMC:PAA electrode formulation.

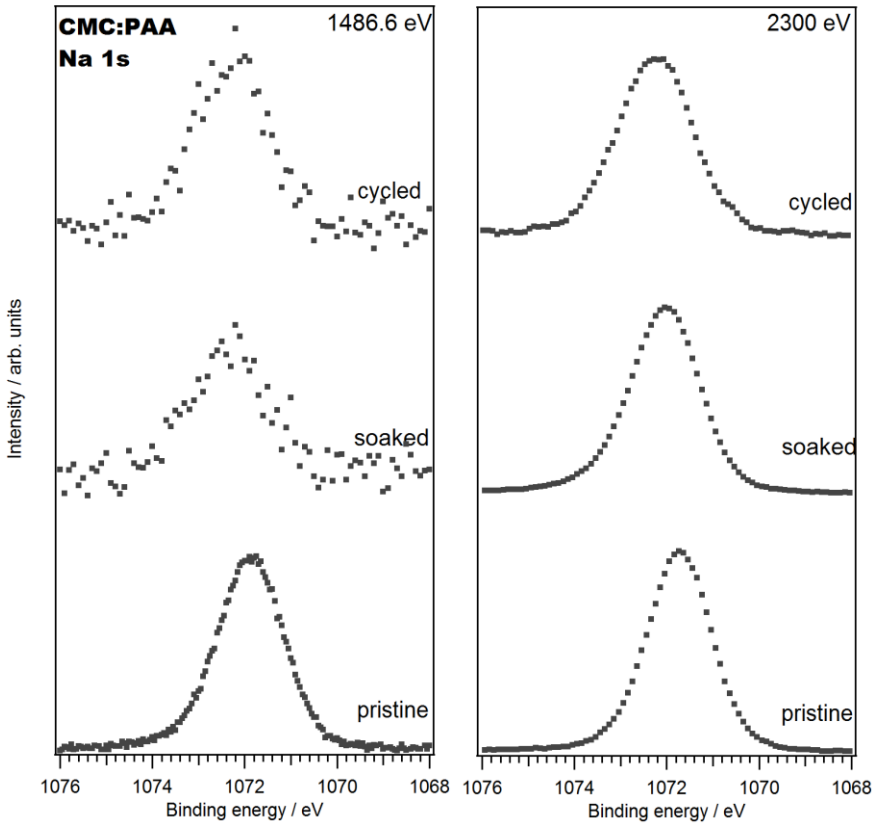

Figure S18. Na 1s spectra of pristine, soaked and cycled samples of the CMC:PAA electrode formulation.

3.5. Figure 4 enlarged

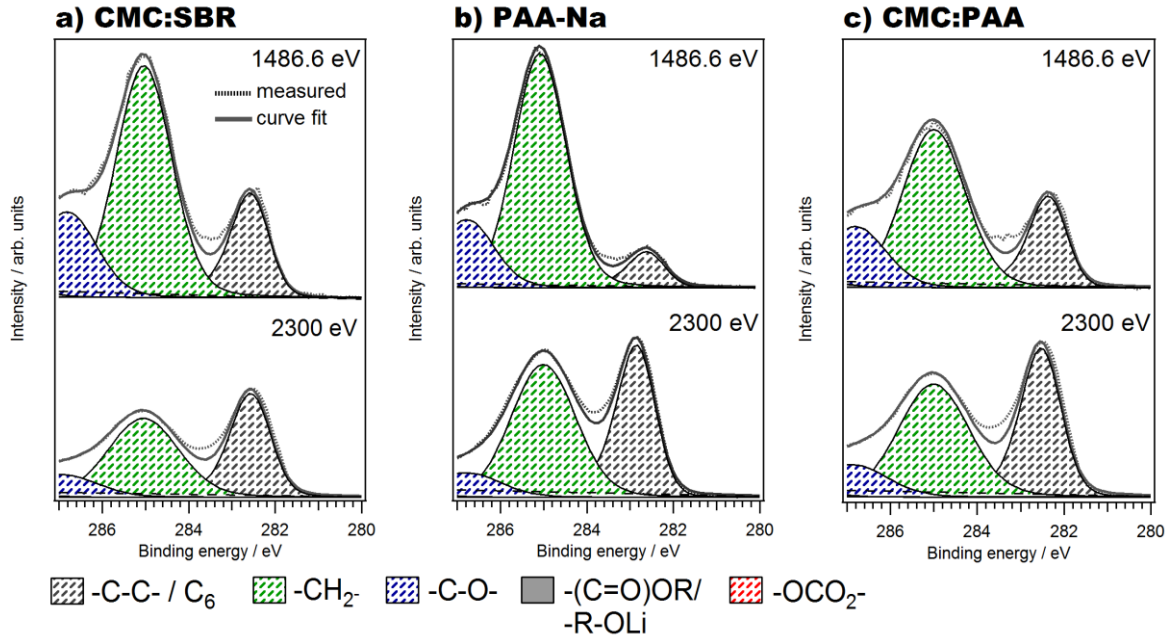

Figure S19. C 1s spectra for two different photon energies (top row: 1487 eV, bottom row: 2300 eV) of cycled electrodes containing 4 wt.% of CMC-Na:SBR (a), PAA-Na (b) and CMC-Na:PAA-Na (c), respectively. The spectra was enlarged around the hydrocarbon region.