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Supplementary Information

High performance polymer binders inspired by chemical finishing of textiles for silicon anodes in lithium ion batteries

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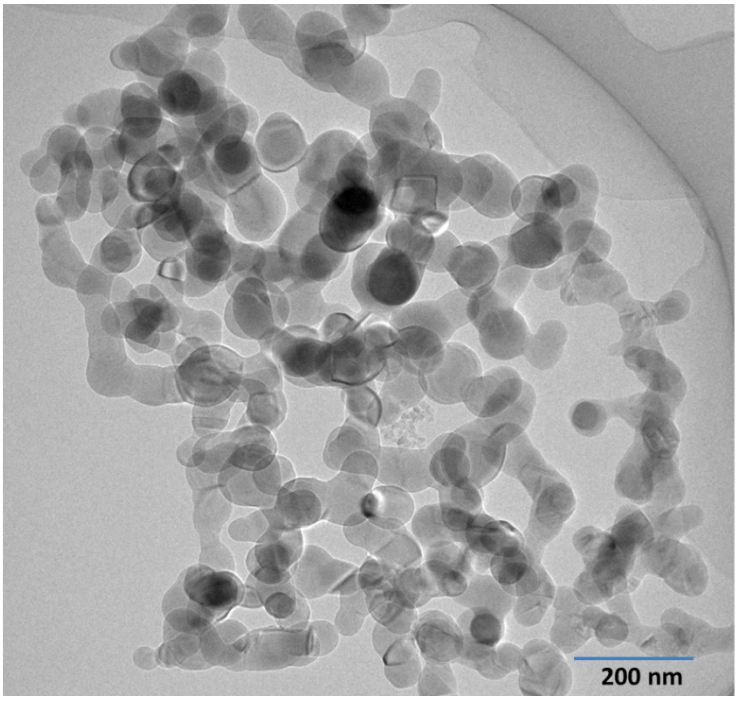

Figure S1. TEM of the Si nanoparticles used.

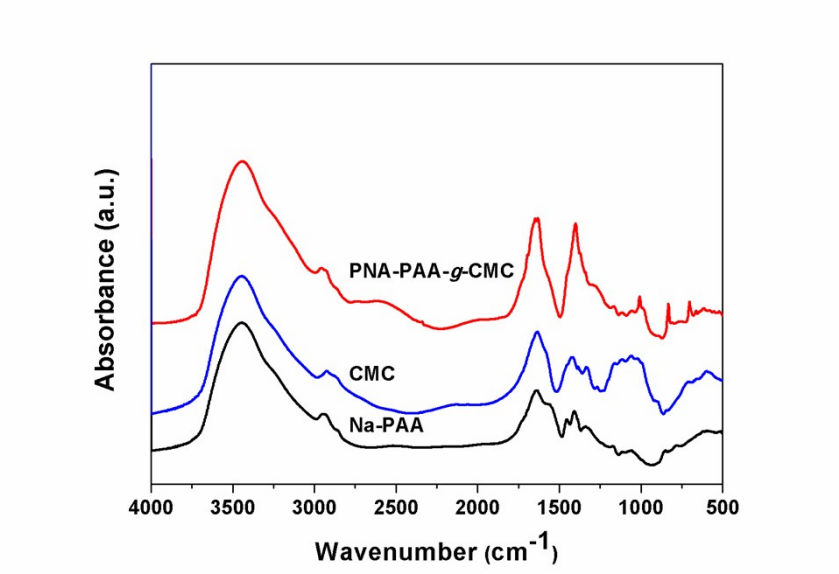

Figure S2. Full FTIR spectra of NaPAA, CMC and PNA-NaPAA-*g*-CMC.

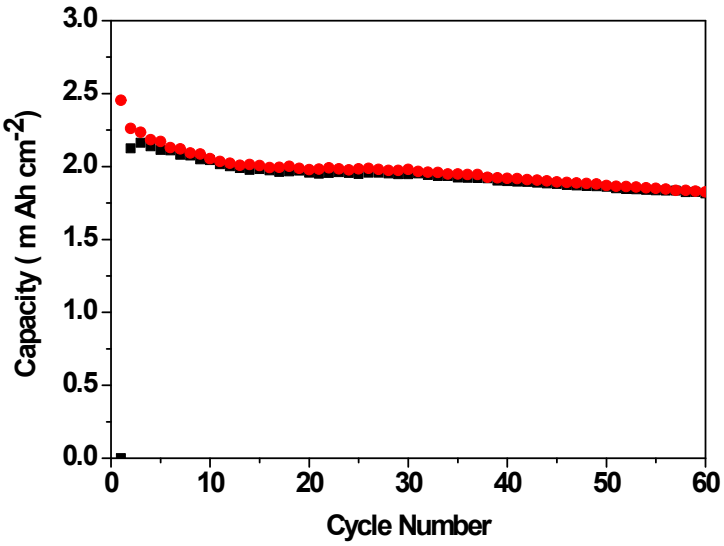

Figure S3. Cycling performance of Si anode with PNA-NaPAA-*g*-CMC binder. The mass loading of electrode material on Cu foil was 1.3 mg cm^{-2}.

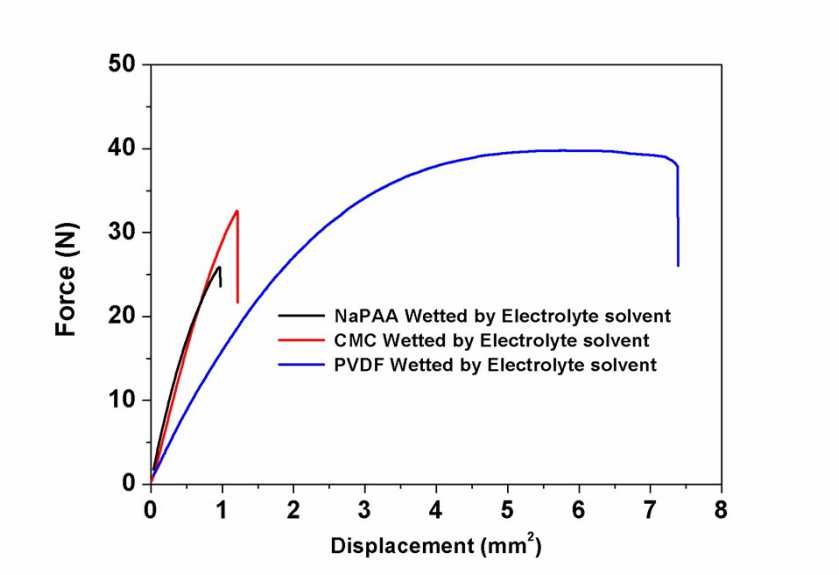

Figure S4. The tensile tests of NaPAA, CMC and PVDF impregnated with electrolyte.

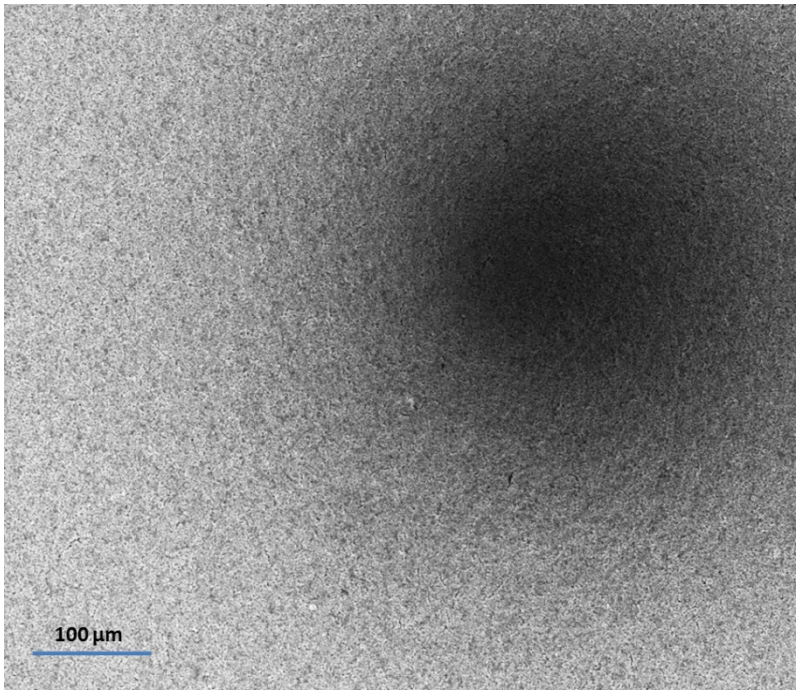

Figure S5. SEM image of Si electrode using PNA-NaPAA-*g*-CMC as binder.

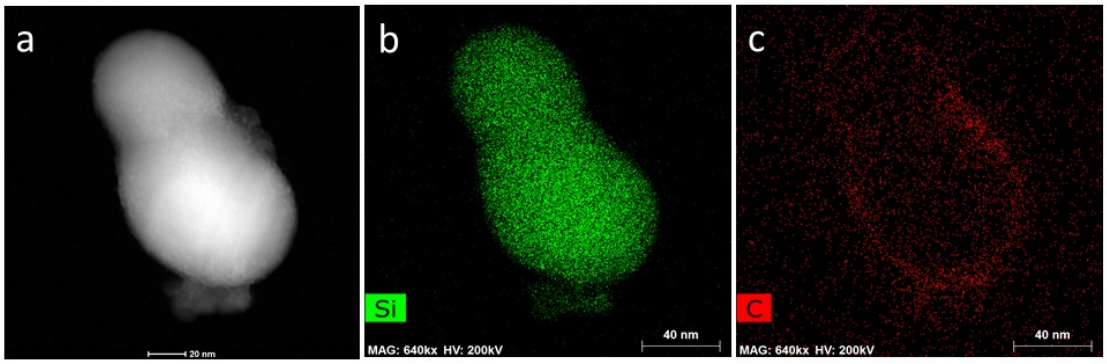

Figure S6. The TEM (a) and the corresponding element mapping (b,c) of the Si nanoparticles in the crosslinked PNA-NaPAA-*g*-CMC-based Si electrodes. A clear carbon thin film was found to cover the Si nanoparticles. The carbon thin film was definitely ascribed to PNA-NaPAA-*g*-CMC because only PNA-NaPAA-*g*-CMC and carbon blacks contain carbon elements in the Si electrodes (the carbon element is not from the carbon blacks because the shape and the large particle size (>100 nm) of the carbon black is not consistent with the carbon distribution).

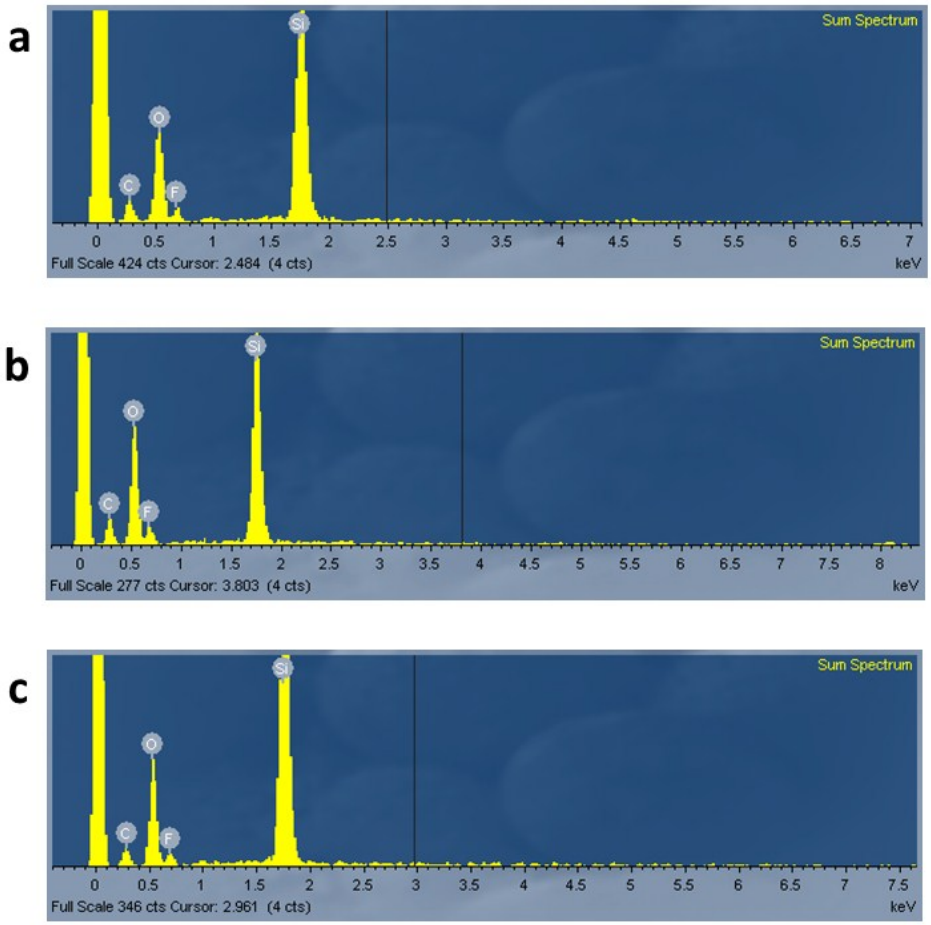

Figure S7. SEM-EDS images of the cycled Si electrodes using PNA-NaPAA-*g*-CMC (a), NaPAA (b) and CMC (c) as binders. The F element which was the component of the SEI layers can be found on the cycled Si electrode film.

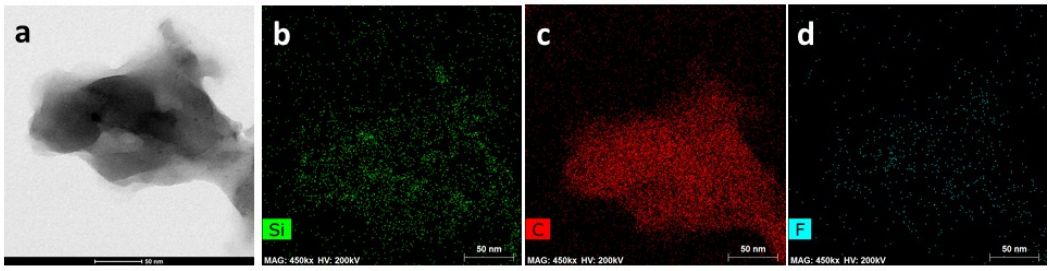

Figure S8. TEM and TEM-EDS element mapping of the cycled Si electrodes using PNA-NaPAA-*g*-CMC as binder.

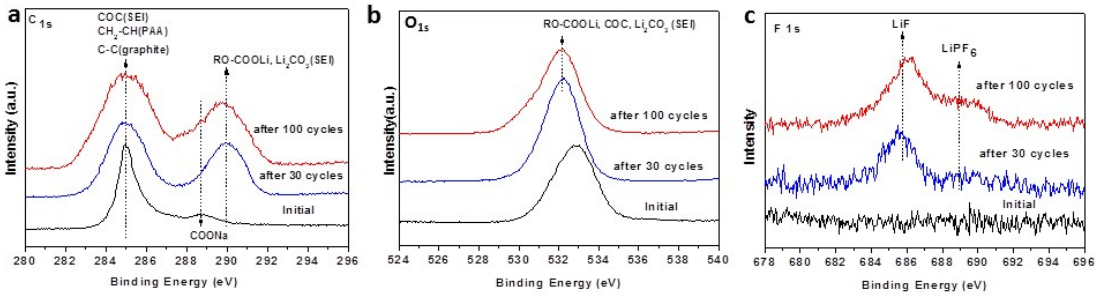

Figure S9. XPS of the Si electrodes using PNA-NaPAA-*g*-CMC as binders before and after cycling.

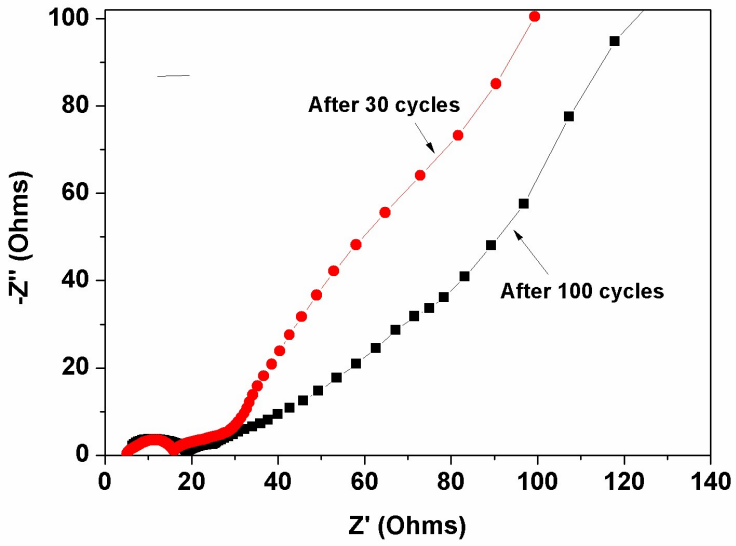

Figure S10. The Nyquist plot of the PNA-NaPAA-*g*-CMC-based Si anode after 30 and 100 cycles.