PEO-$Li_{21}Si_5$ as a pre-lithiation and structural protection layer for lithium-ion batteries

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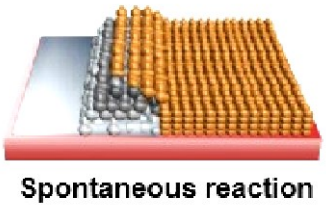
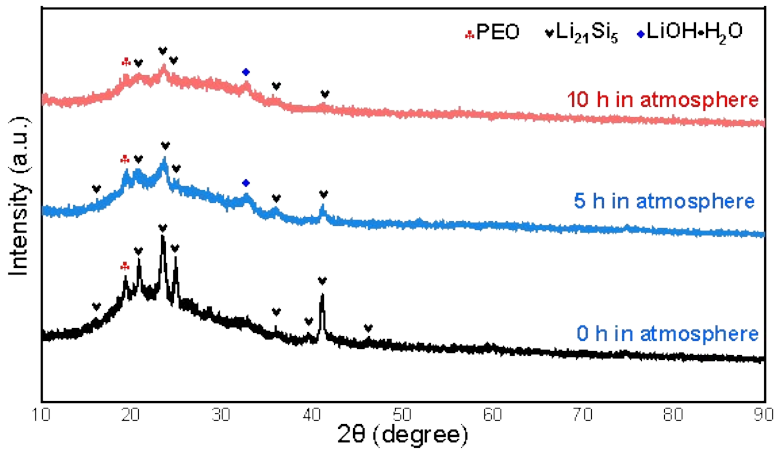
Keywords: $Li_{21}Si_5$ alloy; pre-lithiation layer; structural protection layer; Si@C anode; lithium-ion batteries



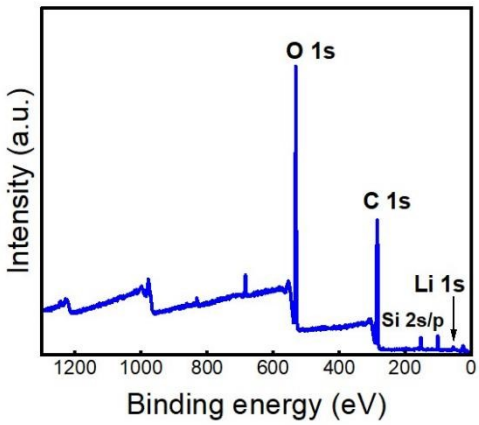
Supplementary Figure 1. Fragmentation process of the $Li_{21}Si_5$ particles.

Supplementary Figure 2. Optical Picture of the $Li_{21}Si_5$ porder.

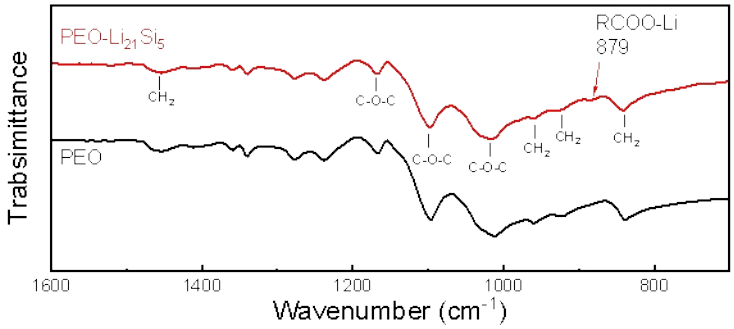
Supplementary Figure 3. Reaction between $Li_{21}Si_5$ and polar solutions.



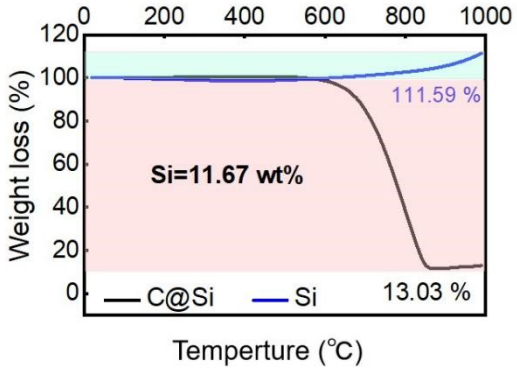
Supplementary Figure 4. XRD data of PEO-$Li_{21}Si_5$ patterns exposure in ambient air (40% humidity).



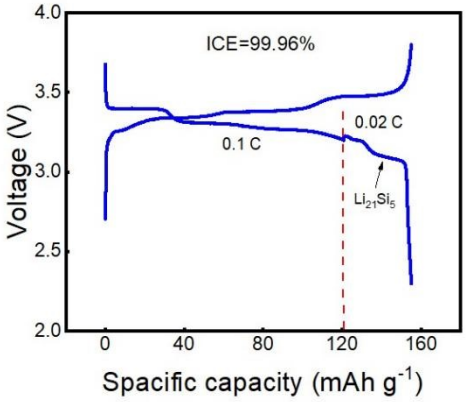
Supplementary Figure 5. XPS full spectrum of PEO-$Li_{21}Si_5$ powder.



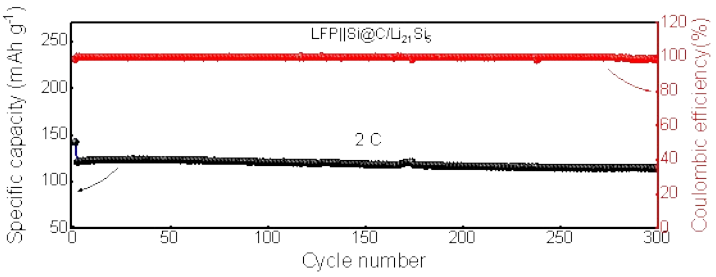
Supplementary Figure 6. FTIR spectra of PEO and PEO-$Li_{21}Si_5$.



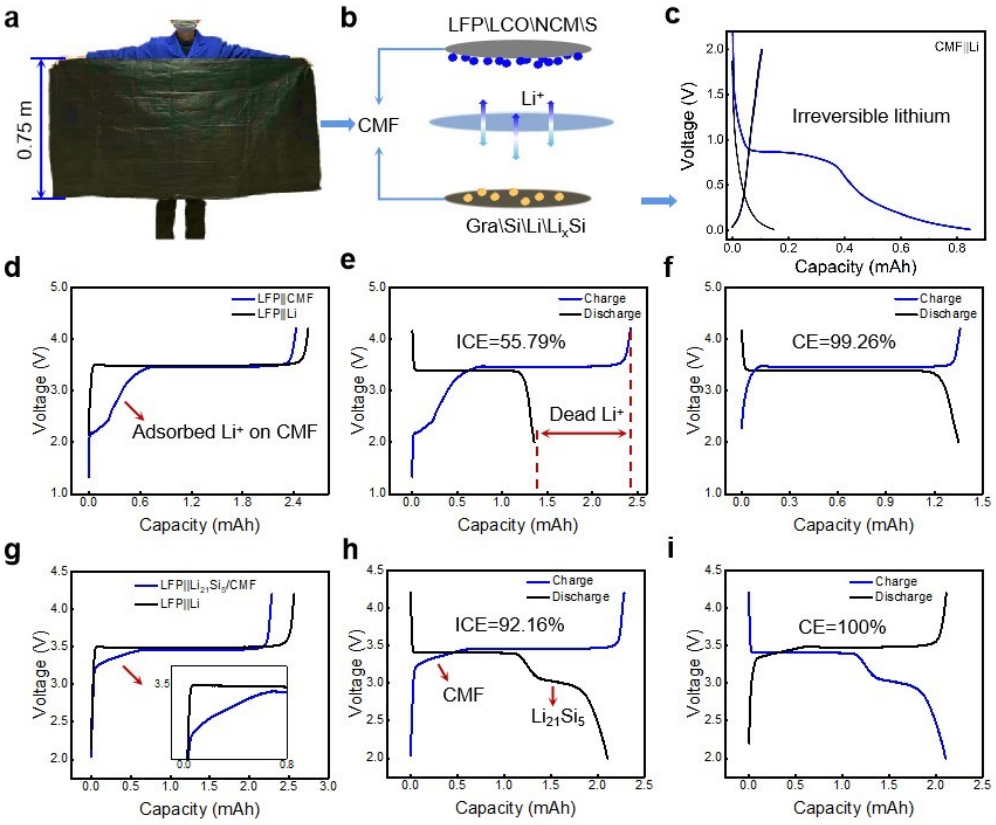
Supplementary Figure 7. Thermogravimetric test of Si@C powder.



Supplementary Figure 8. First charge/discharge curves of LFP||Si@C/$Li_{21}Si_5$ full-cell at 0.02 C.



Supplementary Figure 9. long-term cycling test of LFP||Si@C/$Li_{21}Si_5$ full cell at 2 C.



Supplementary Figure 10. Application of $Li_{21}Si_5$ in carbon-based collectors. a, photograph of carbon nanotube macroscopic film (CMF). b, schematic diagram of CMF as a collector. c, irreversible lithium embedding phenomenon of CMF as an anode collector. d, charging curve of LFP||CMF cell and LFP||Li cell. e, first charge/discharge curve of LFP||CMF cell. f, second turn discharge curve of LFP||CMF cell. g, charging curve of LFP||CMF/$Li_{21}Si_5$ cell and LFP||Li cell. h, first charge/discharge curve of LFP||CMF/$Li_{21}Si_5$ cell. i, second turn discharge curve of LFP||CMF/$Li_{21}Si_5$ cell.