Supporting Information

Hybrid Ionically-Covalently Cross-linked Network Binder for High-Performance Silicon Anodes in Lithium-Ion Batteries

Xuejian Zeng [1, 2], Hongyan Yue[1], JiNa Wu[2], Chao Chen [2,3,4*], Lichun Liu[2,5*]

1 School of Materials Science and Chemical Engineering, Harbin University of Science and Technology, Harbin 150040, People's Republic of China; 2120210121@stu.hrbust.edu.cn (X.Z.); hyyue@hrbust.edu.cn (H.Y.)

2 Nanotechnology Research Institute, Jiaxing University, Jiaxing 314001, China; 20070305010@smail.cczu.edu.cn

3 Key Laboratory of Yarn Materials Forming and Composite Processing Technology of Zhejiang Province, Jiaxing University, Jiaxing 314001, China

4 Shanghai Institute of Applied Physics, Chinese Academy of Sciences , Shanghai 201800, China

5 College of Biological, Chemical Sciences and Engineering, Jiaxing University, Jiaxing 314001, China

* Correspondence: chaochen@zjxu.edu.cn (C.C.); lichun.liu@zjxu.edu.cn (L.L.)

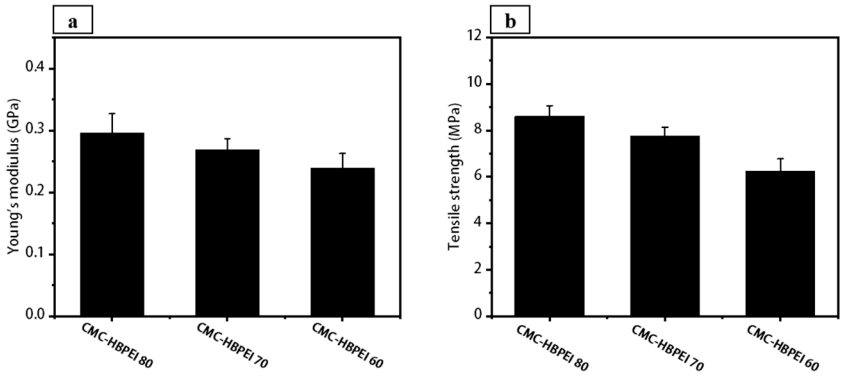

Figure S1. Young's modulus (a) and tensile strength (b) of the reconnected films CMC-HBPEI-80, CMC-HBPEI-70, CMC-HBPEI-60

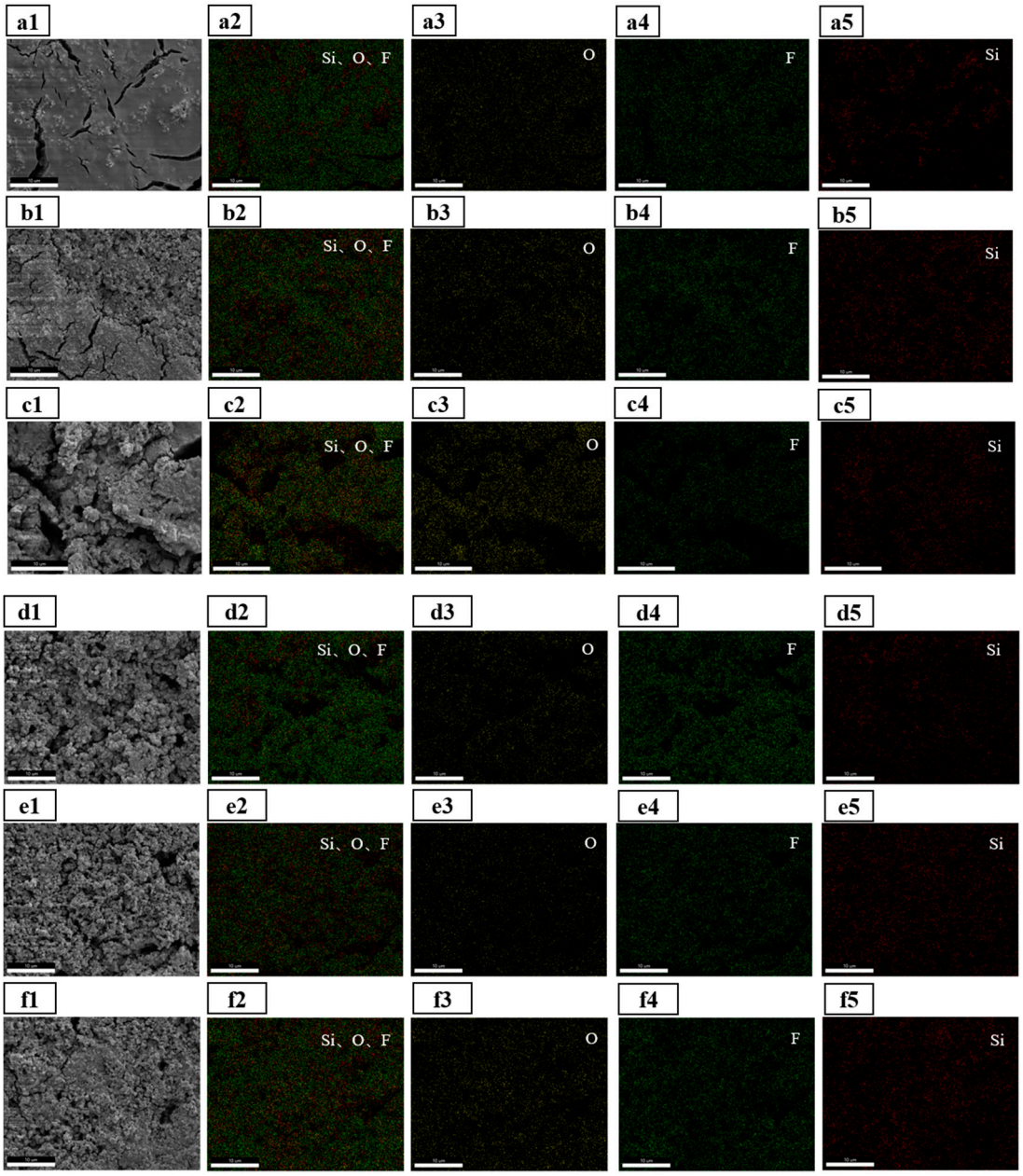

Figure S2. SEM-EDX images of the distribution of different elements after 100 cycles: Si/HBPEI (a), Si/CMC (b), Si/CMC-HBPEI 60 (c), Si/CMC-HBPEI 70 (d), Si/CMC-HBPEI 80 (e) and Si/CMC-HBPEI 90 (f)

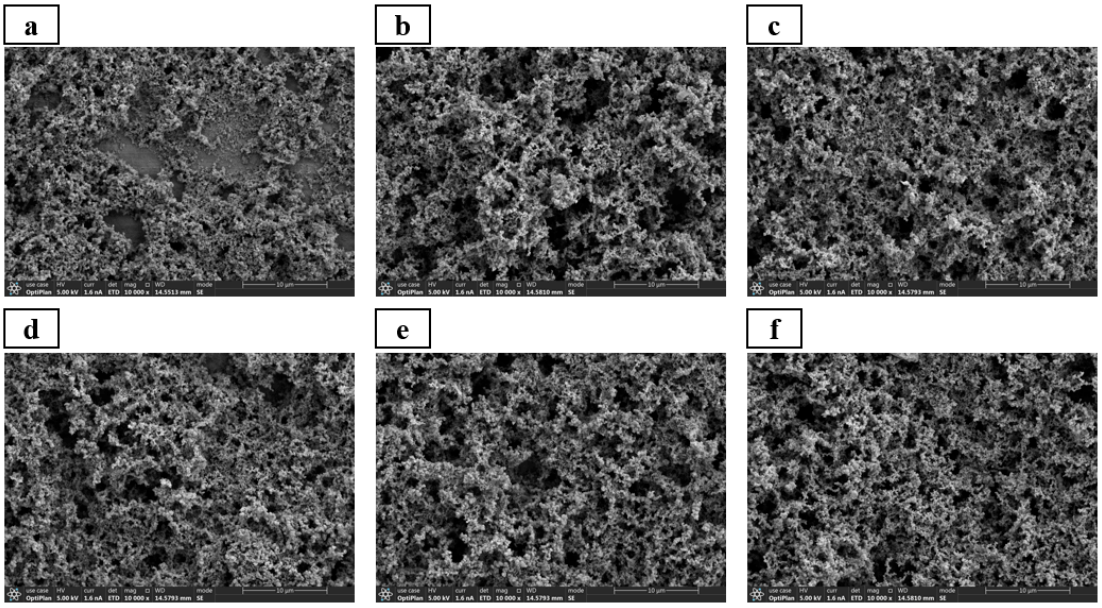

Figure S3. SEM images of Si/HBPEI (a), Si/CMC (b), Si/CMC-HBPEI 60 (c), Si/CMC-HBPEI 70 (d), Si/CMC-HBPEI 80 (e) and Si/CMC-HBPEI 90 (f) anodes before 100 cycles.

Table S1. Cycle performance of Si based anodes with different polymer binders

Binder	CMC-HBPEI-82	PAA [46]	PVA [47]	CS [48]	Karaya Gum [49]	Alg [50]	Lignin [51]	SHP [52]
Specific capacity ($mAh\ g^{-1}$)	2720	3200	2479	2842	2421	2625	1820	2600
Capacity Retention (%)	75 (100^{th})	59 (100^{th})	41 (100^{th})	52 (100^{th})	80 (150^{th})	15 (100^{th})	64 (100^{th})	80 (150^{th})