Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Pre-Planted Nucleation Seeds for Rechargeable Metallic Lithium Anode

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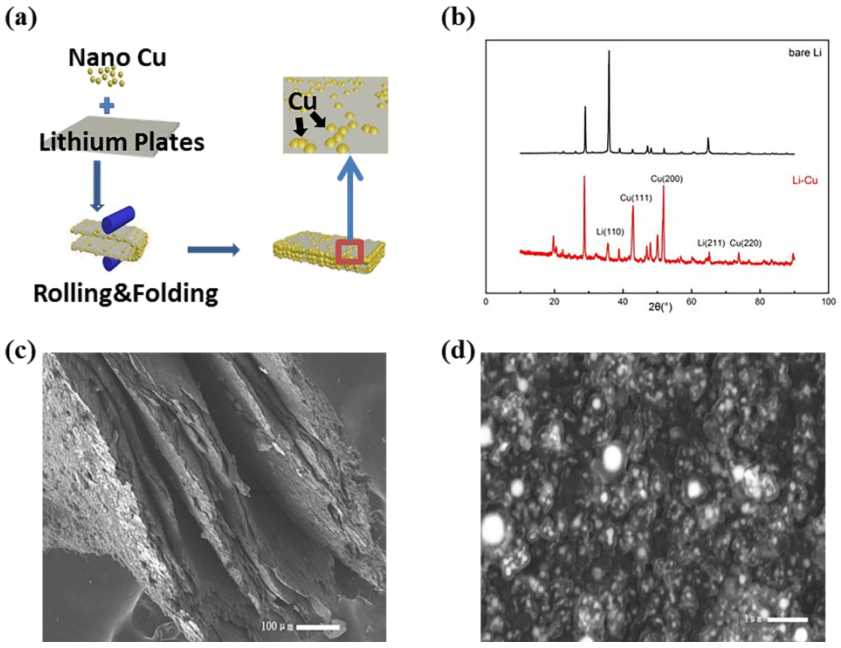

Fig.S1. (a) The synthesis schematic of Li-Cu hybrids mainly consists of rolling&folding. (b) XRD spectrum of Li-Cu hybrids and bare Li (c) Sectional view of Li-Cu hybrids exhibited a typical lamellar structure. (d) Top view of Li-Cu hybrids showed that numerous copper nanoparticles distributed on lithium.

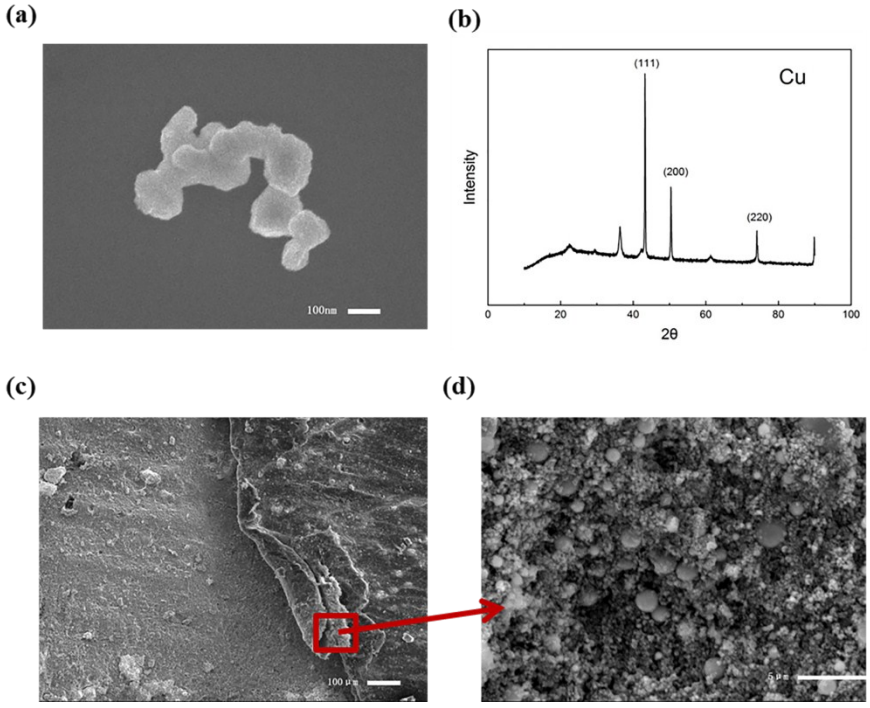

Fig.S2. SEM picture and XRD spectrum of Cu nanoparticles were respectively shown in (a) and (b).SEM of Li-Cu hybrids at the place where some sheets rolled up (c-d) revealed that Cu nanoparticles were distributed in the lamellar structure of the hybrids.

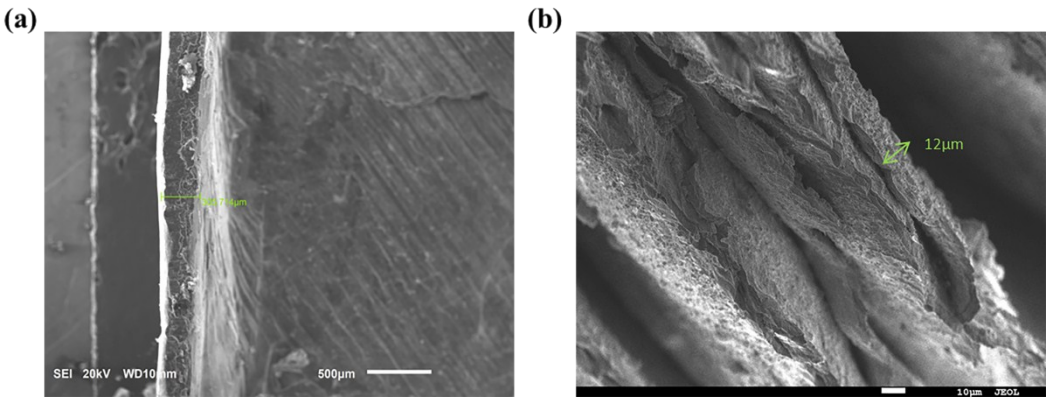

Fig.S3. SEM images of the sectional morphology of Li-Cu hybrid demonstrated that the thickness of the hybrid is about 300microns, and the internal layer thickness is about dozens of microns.

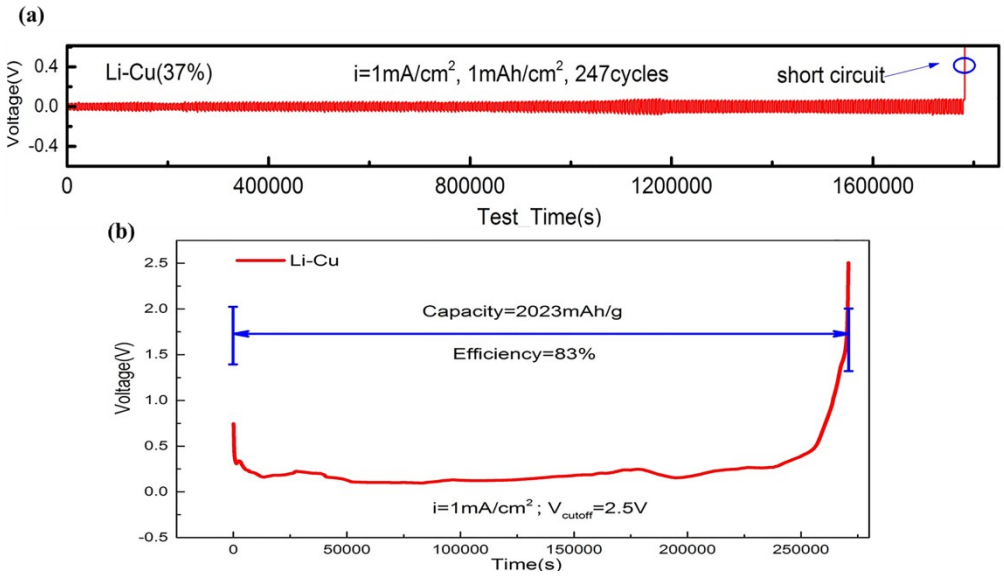

Fig. S4. (a)The complete voltage profile untill Li-Cu(37%) cell make a short circuit revealed that Li-Cu (37%) can maintain stable cycling for more than 480h. (b) Typical discharge profile of Li-Cu(37%) hybrids revealed a specific capacity of 2023mAh g^{-1}

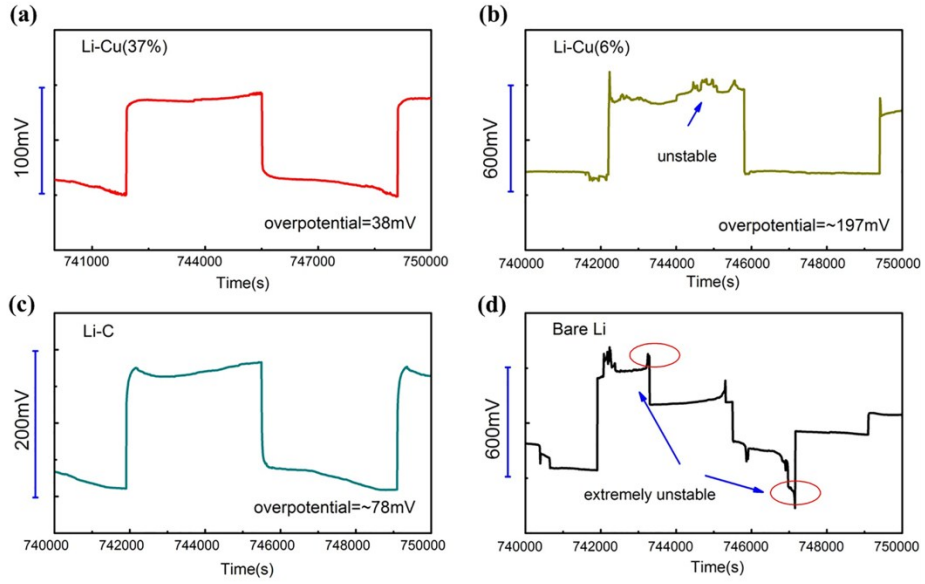

Fig. S5. The magnified voltage profile at 104th cycle for (a) Li-Cu(37%), (b) Li-Cu(6%), (c) Li-C and (d) bare Li.

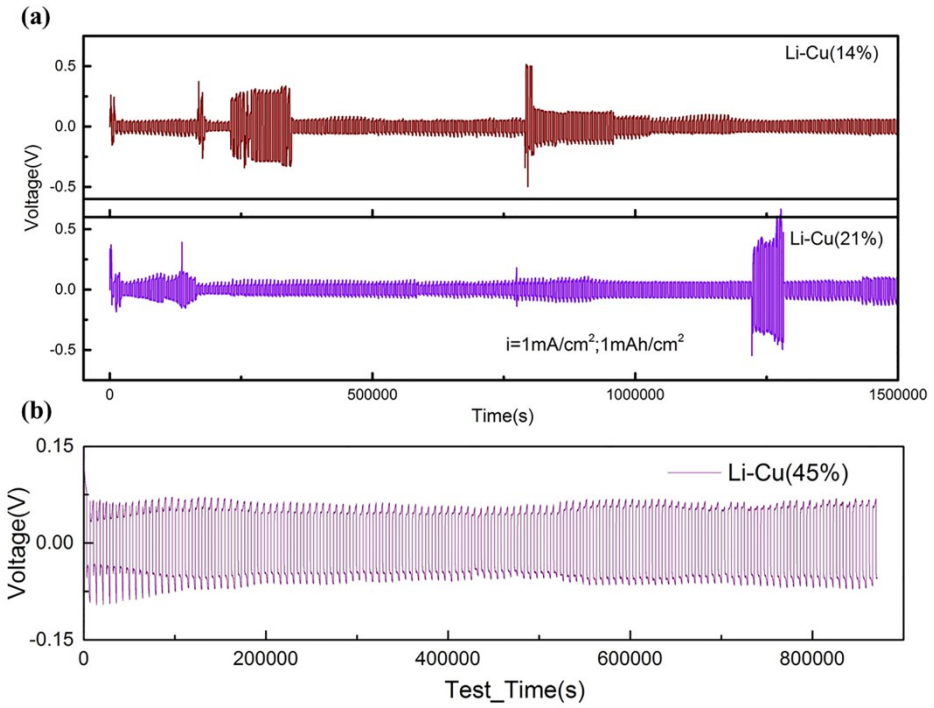

Fig. S6. Electrochemical performance of Li-Cu hybrids with (a) lower Cu content and (b) higher lower Cu content indicated that the stability of Li-Cu hybrids increased with the percentage of Cu.

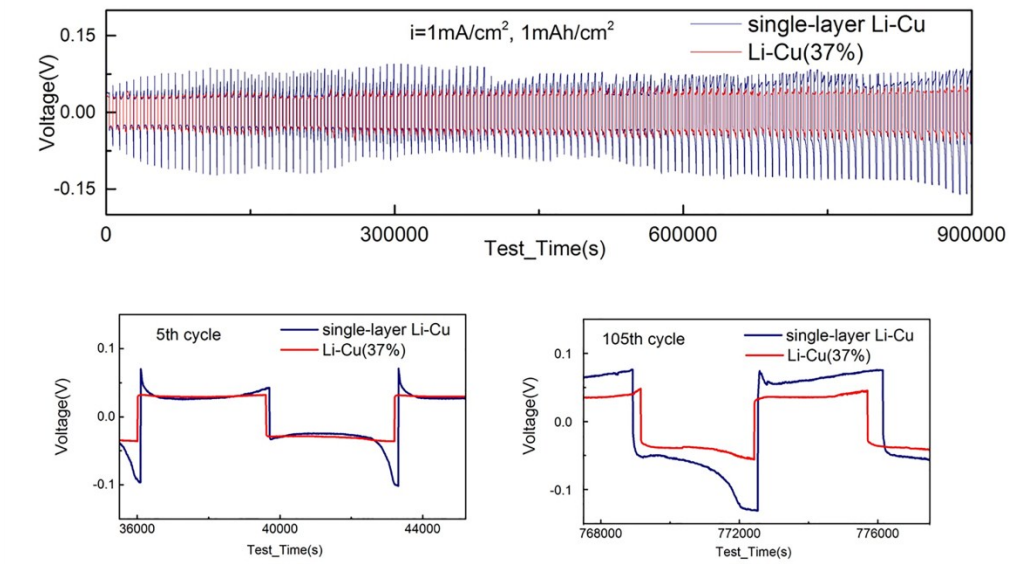

Fig.S7. (a)Electrochemical performance of single-layer Li-Cu hybrid. Magnified voltage profile at the (b) 5th cycle and (c) 105th cycle revealed the superior stability of multi-layer Li-Cu hybrid.

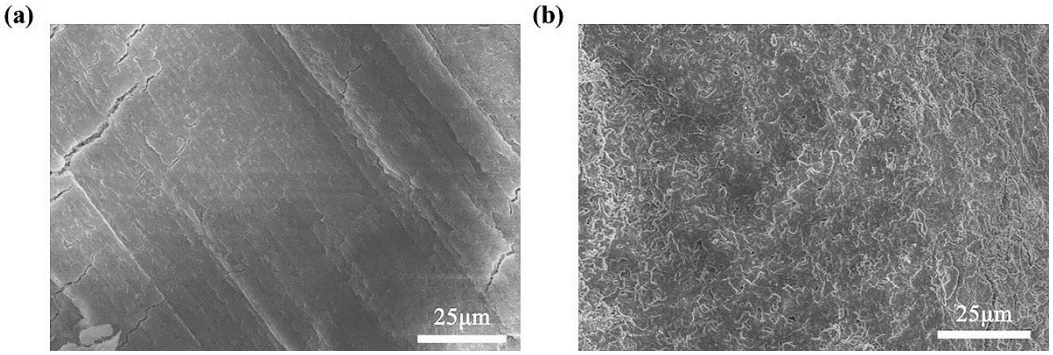

Fig.S8. SEM images of single-layer Li-Cu hybrid after cycling for (a)50 and (b)200 cycles under a current density of 1mA/cm^2 and a capacity of 1mAh/cm^2.

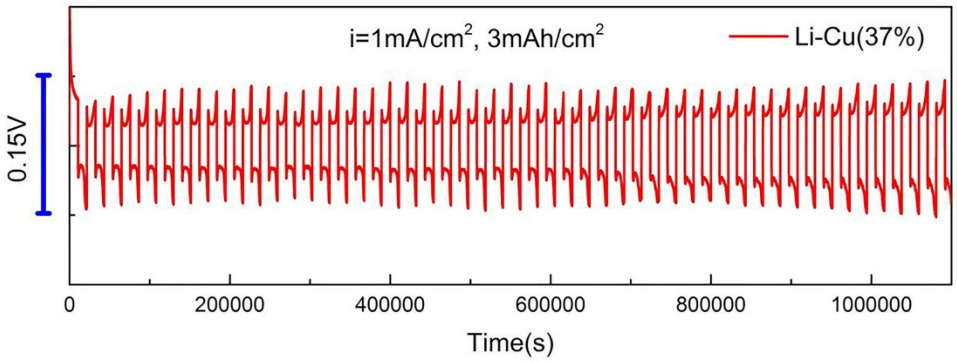

Fig.S9. Electrochemical performance of Li-Cu hybrid under a higher capacity of 3mAh/cm^2.

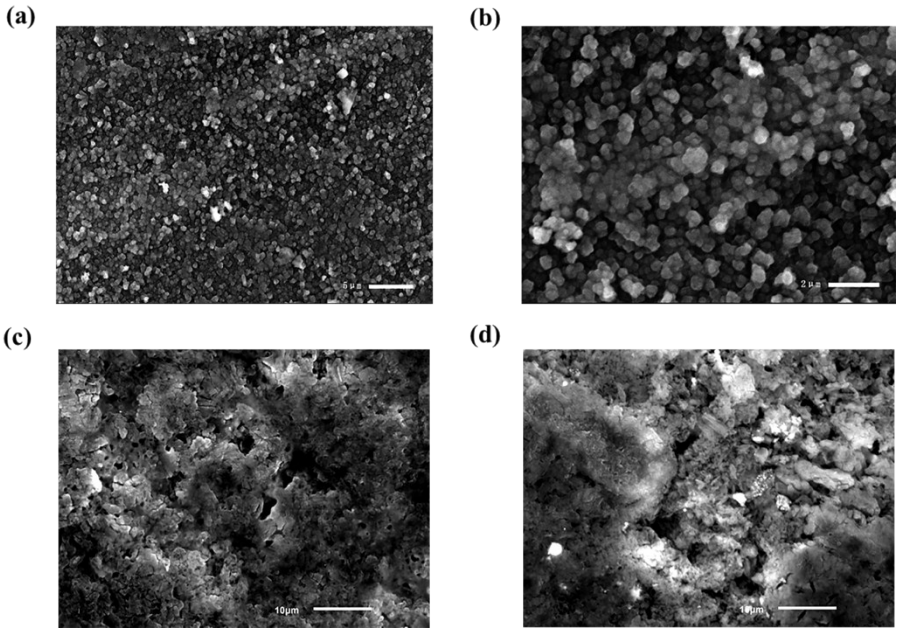

Fig.S10. High magnification SEM images after 30 cycles for (a)(b) Li-Cu hybrid and (c)(d) bare Li electrodes displayed totally different morphology. The granular-like deposition of Li in Li-Cu electrode indicated that Cu nanoparticles had significant influence on the nucleation behavior

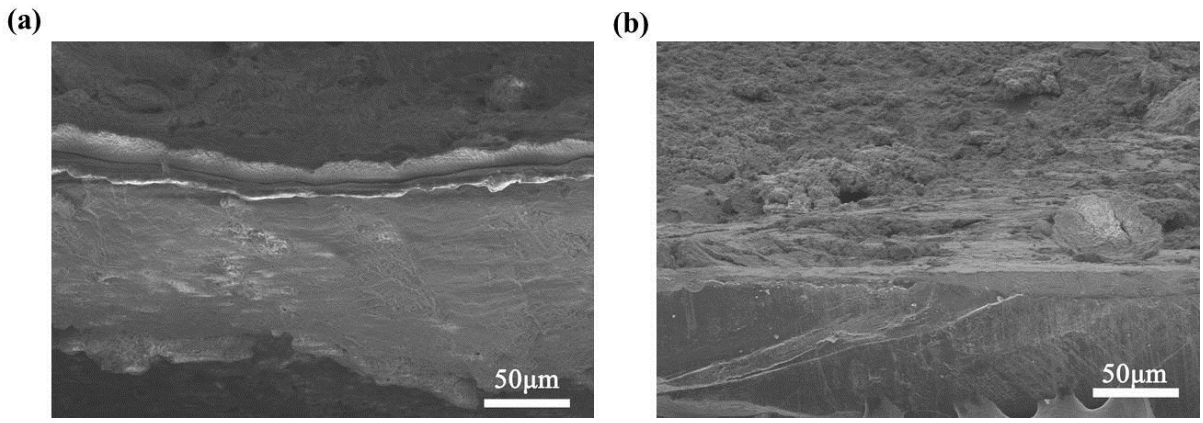

Fig.S11. High magnification SEM images of cross-sectional morphology after 200 cycles for (a) Li-Cu hybrid and (b) bare Li electrodes.

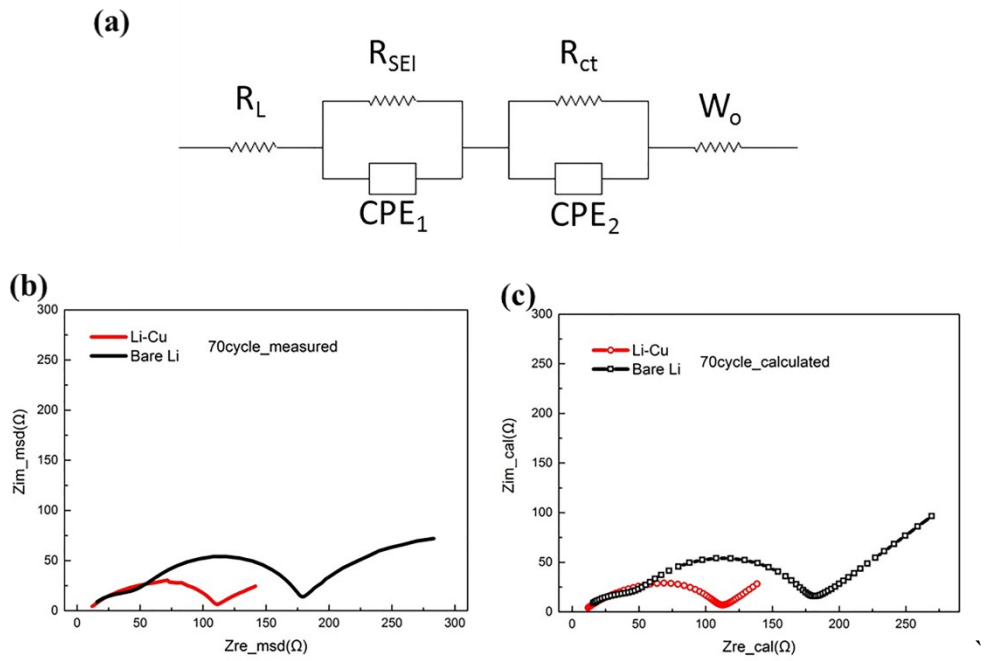

Fig.S12.Test results and analysis of EIS (a) Equivalent circuit used for calculation included three kinds of resistances: R_L, R_{SEI} and R_{ct}. Nyquist plots (b)measured and (c)calculated of Li-Cu hybrids and bare Li symmetric cells after 70cycles indicated a lower resistance of the .Li-Cu hybrids anode.

	R_L [Ω]	R_{SEI} [Ω]	R_{ct} [Ω]
Li-Cu	8.233	36.59	65.92
Bare Li	8.283	46.15	118.6

Table S1.calculation results for EIS