Supporting Information for

Stable High-areal-capacity Nanoarchitectured Germanium Anodes on Three-dimensional Current Collectors for Li Ion Microbatteries

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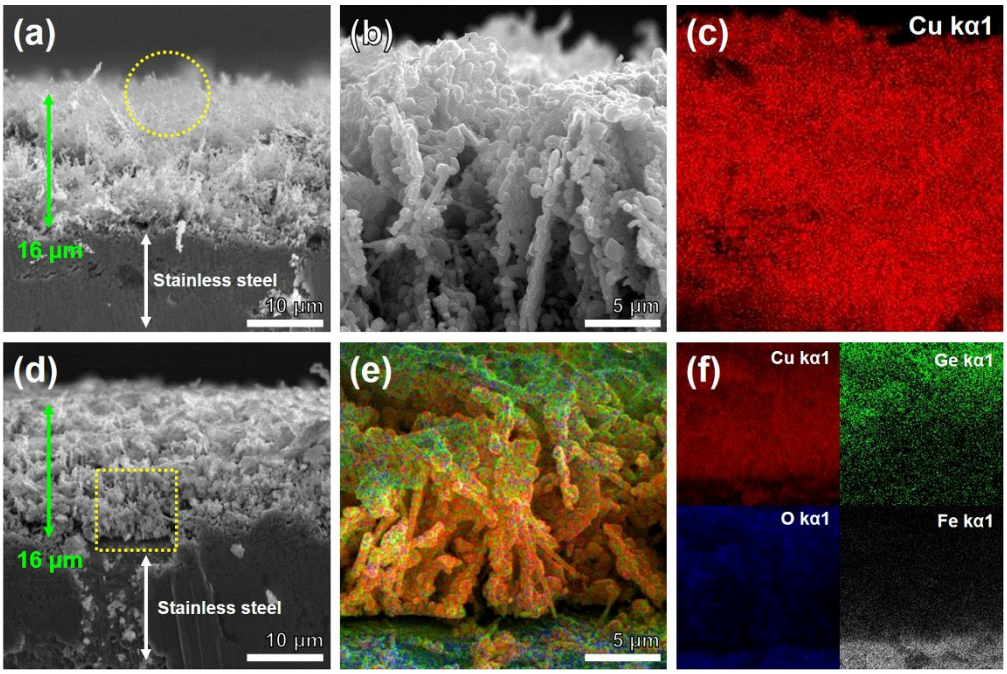

Fig. S1 Cross-sectional FESEM images of (a, b) the Cu NNs and (d,e) the Ge-na/Cu NNs after thermal evaporation for 20 min. SEM-EDS element mapping analysis of (c) the Cu NNs and (f) the Ge-na/Cu NNs after thermal evaporation for 20 min. The EDS element color-mixing mapping is shown in (e).

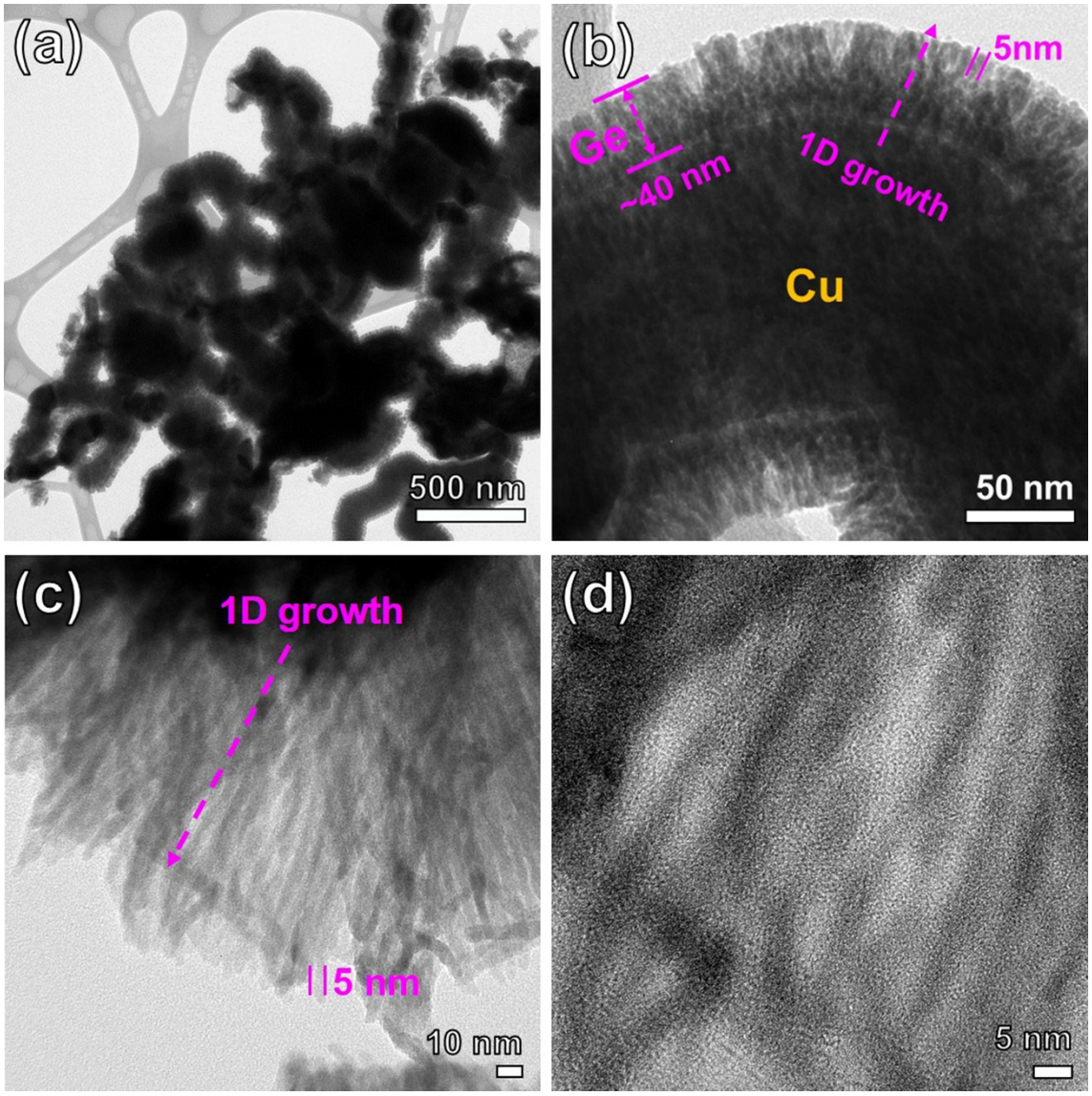

Fig. S2 (a) Low-magnification TEM image and (b) HRTEM image of immature Ge-na/Cu NNs. (c) Low-magnification TEM image and (d) HRTEM image of Ge nanoarrays after 8 h of deposition.

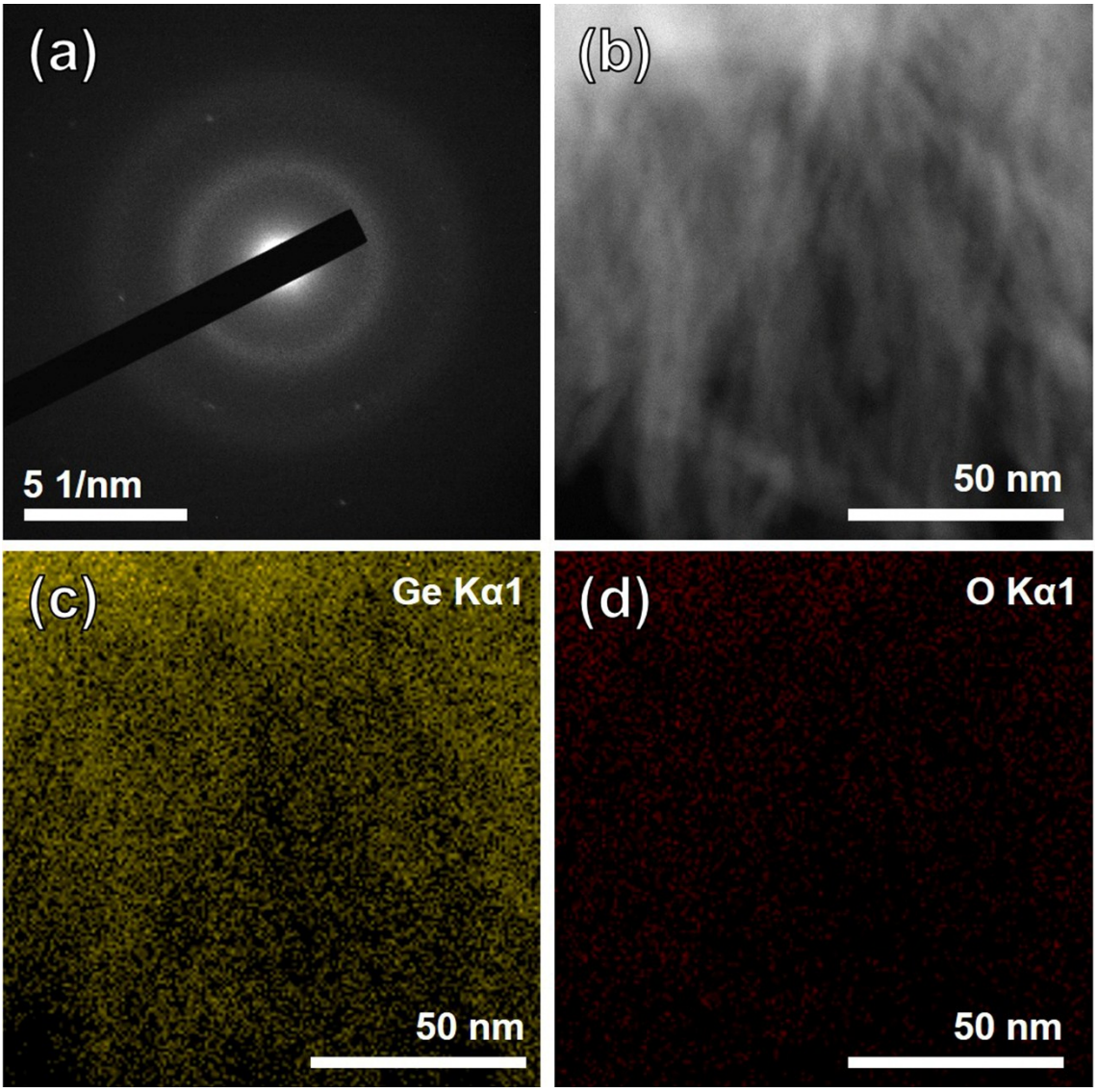

Fig. S3 (a) SEAD pattern, (b) STEM image, and EDS mapping profile of (c) Ge and (d) O of the Ge nanoarrays at deposition time of 8 h.

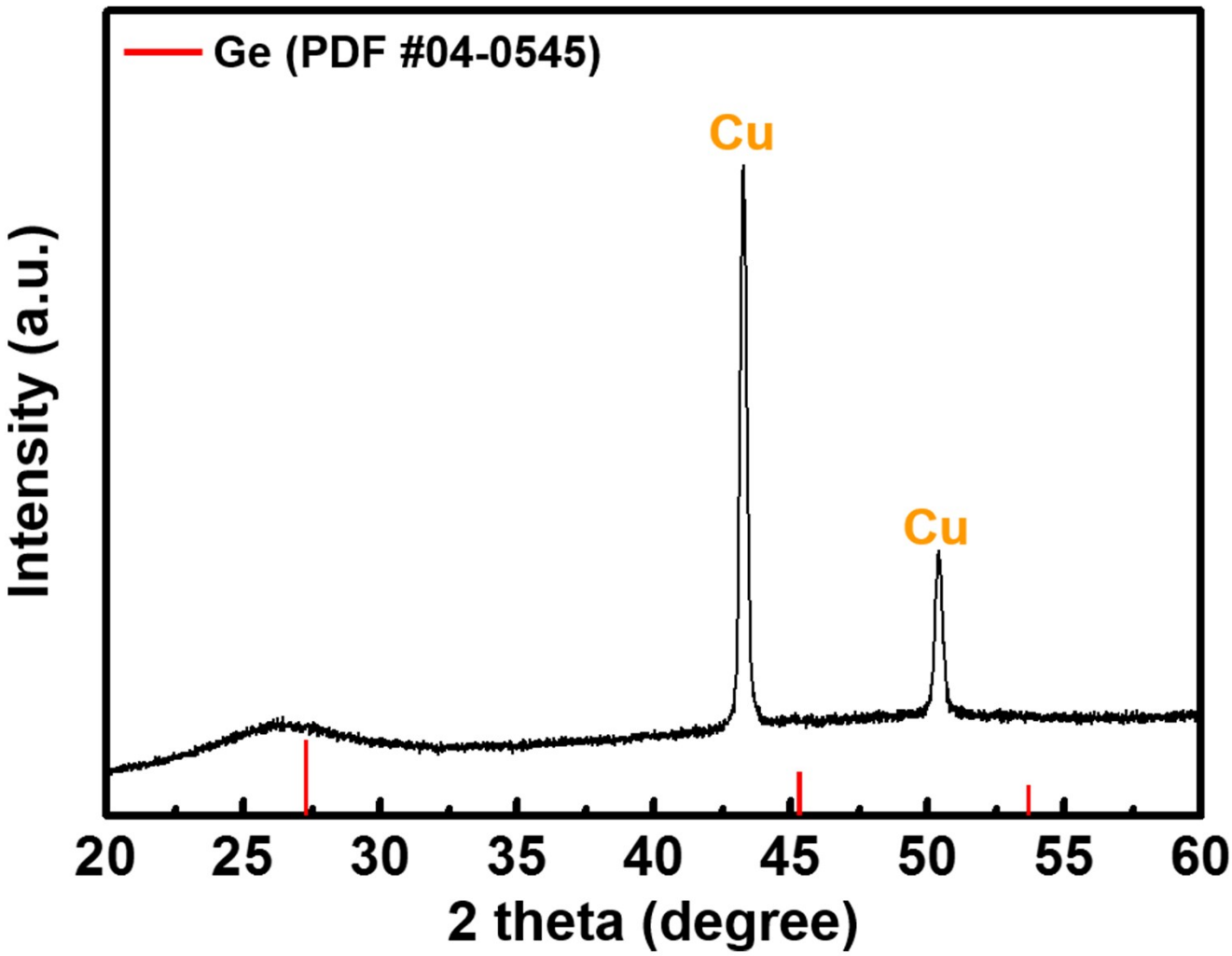

Fig. S4 XRD pattern of the Ge-na/Cu NNs at a deposition time of 8 h.

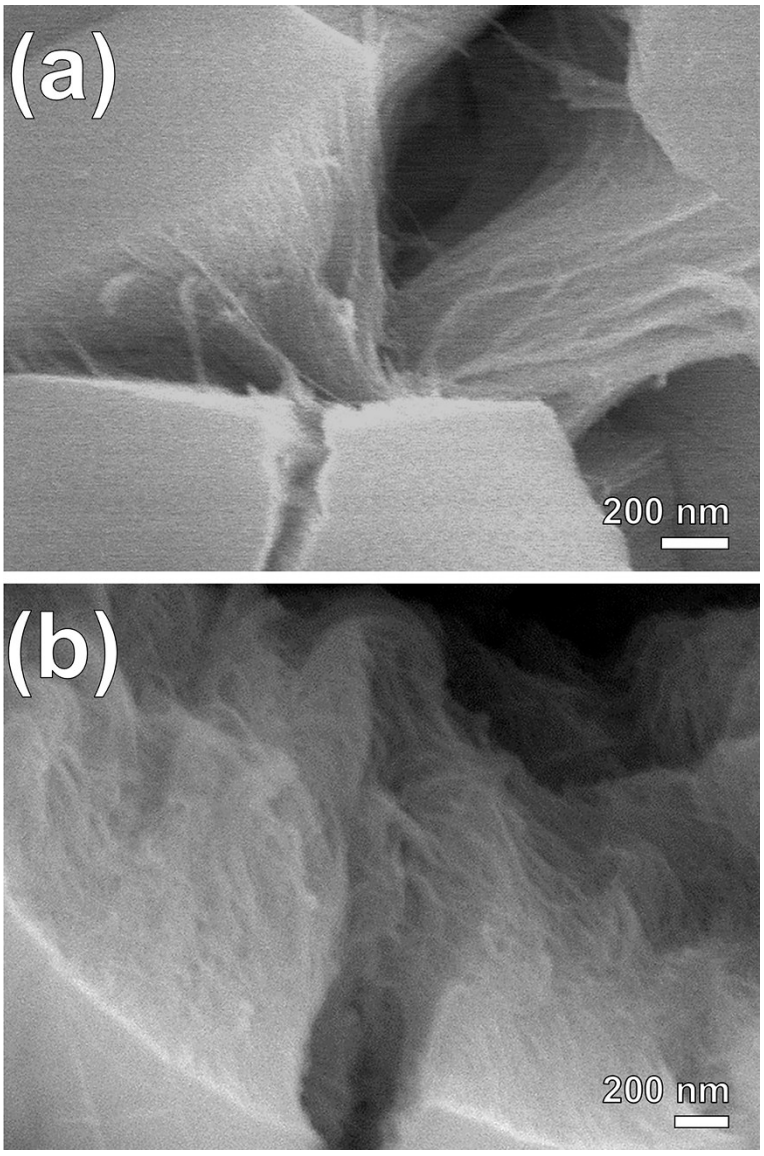

Fig. S5 FESEM images at high magnification of the Ge nanoarrays at deposition times of (a) 4 h and (b) 8 h.

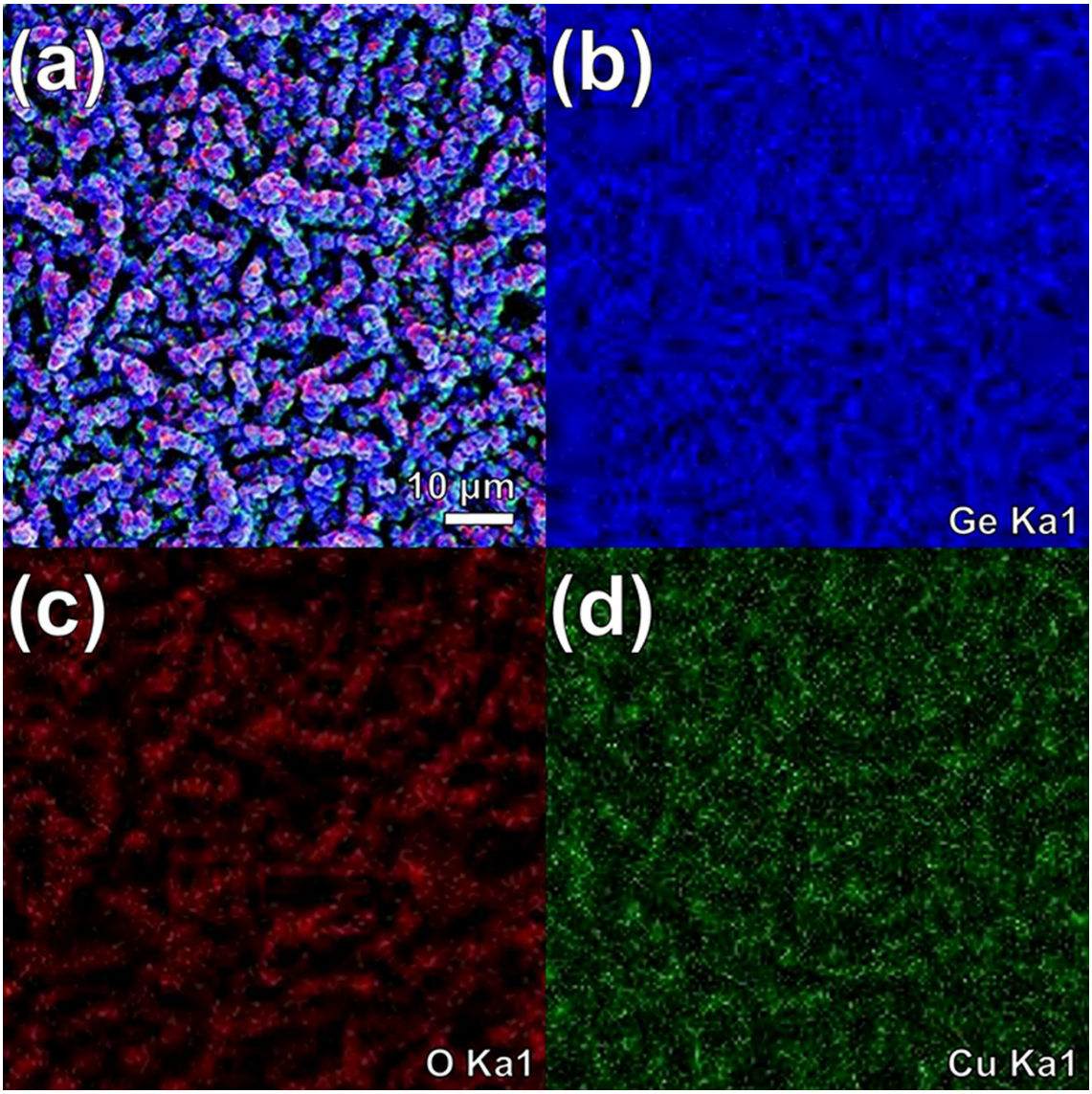

Fig. S6 EDS element mapping analysis of the Ge-na/Cu NNs at 4 h showing (a) EDS element color mixing mapping, where the elements are distinguished by color: (b) Ge (blue), (c) O (red), and (d) Cu (green).

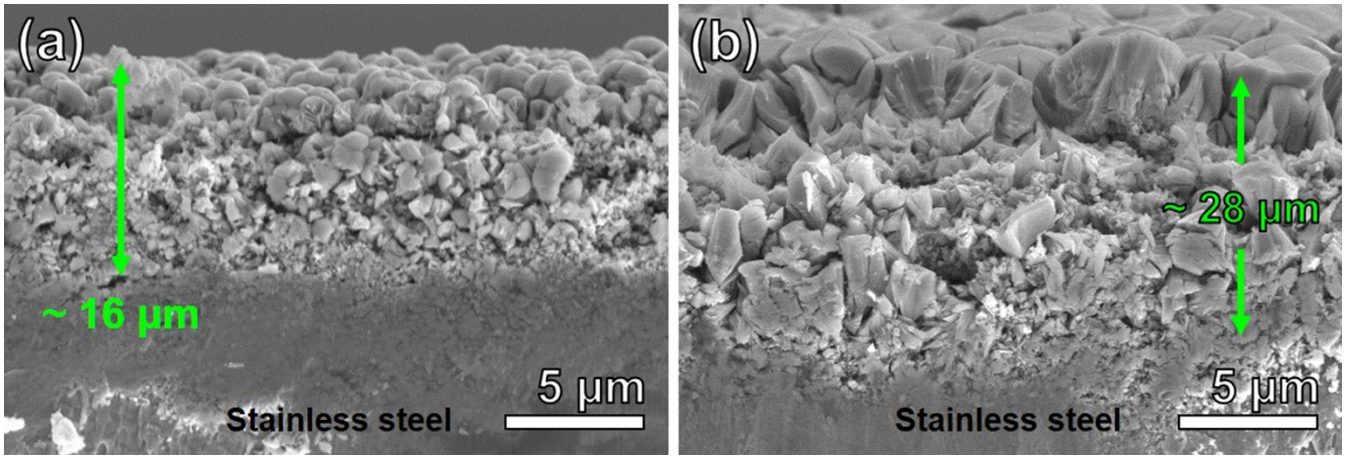

Fig. S7 Cross-sectional FESEM images of the Ge-na/Cu NNs by (a) thermal evaporation for 4 h and (b) 8 h.

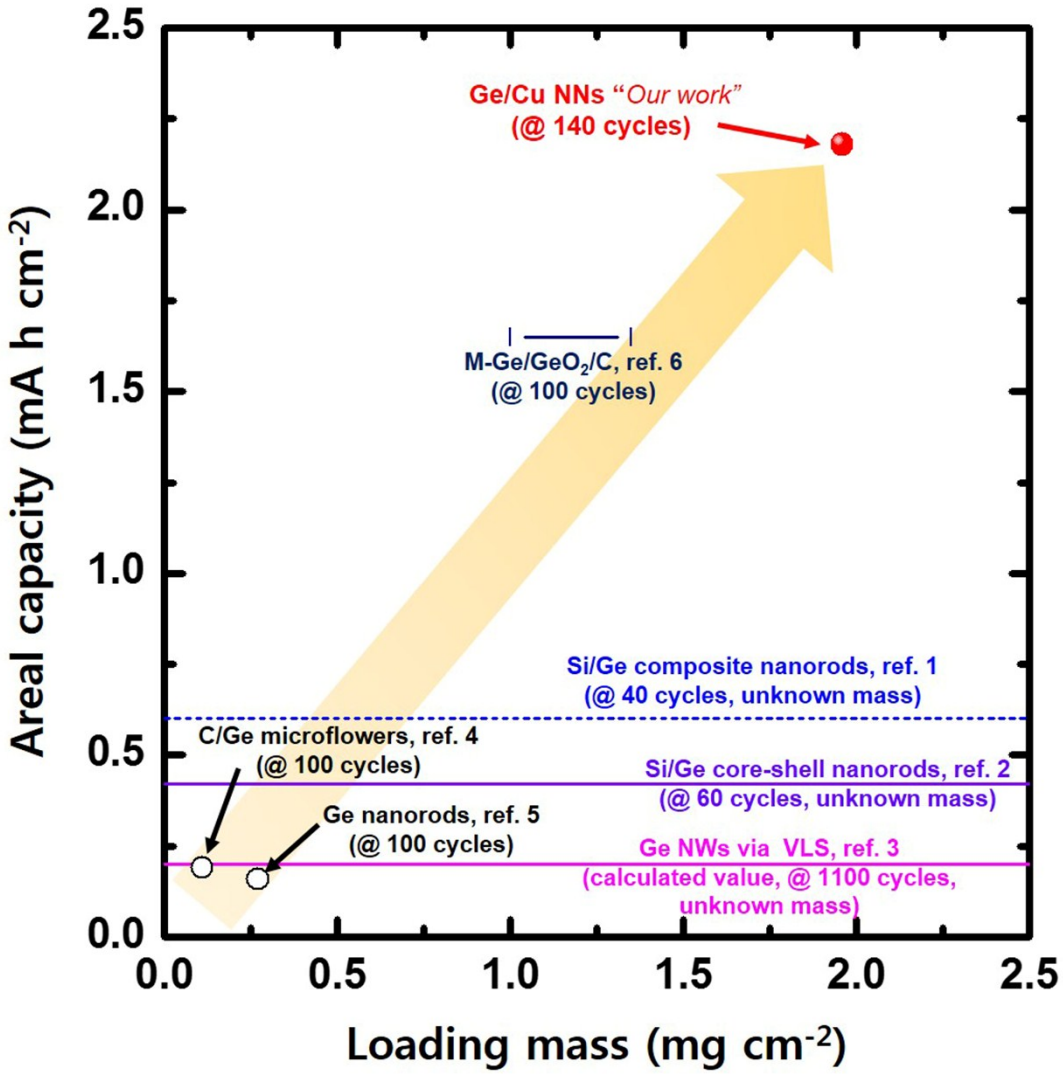

Fig. S8 Areal capacities of Ge based anodes.

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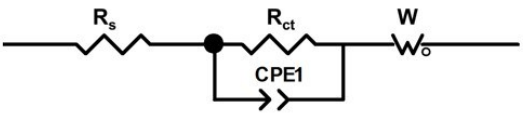
Cycle	RC equivalent circuit model	R_s (Ω mg^{-1})	R_{ct} (Ω mg^{-1})
1st discharge		5.23	45.73
5th discharge		5.99	41.55
10th discharge		8.53	32.13
20th discharge		6.68	22.84

Table S1. RC equivalent circuit model and corresponding fitting values of the high mass electrode.

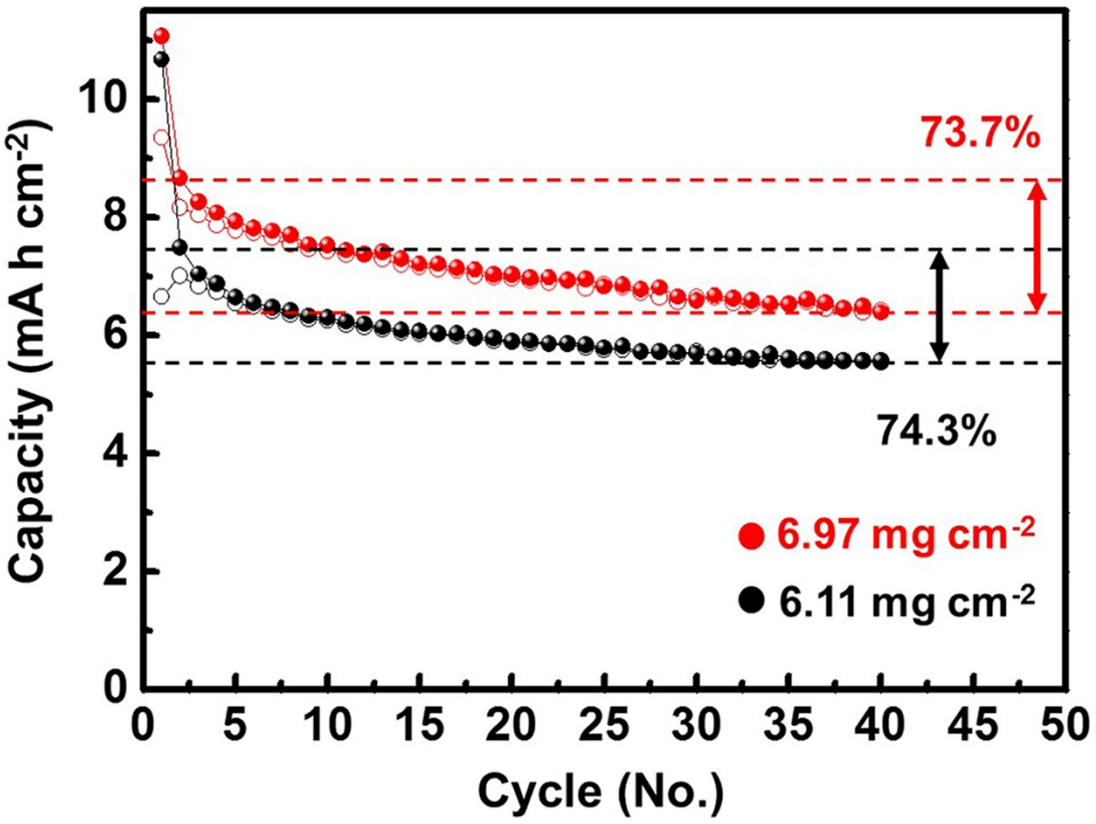


Fig. S9 Areal capacity of the Ge-na/Cu NNs with mass loading above 6 mg cm^{-2}.

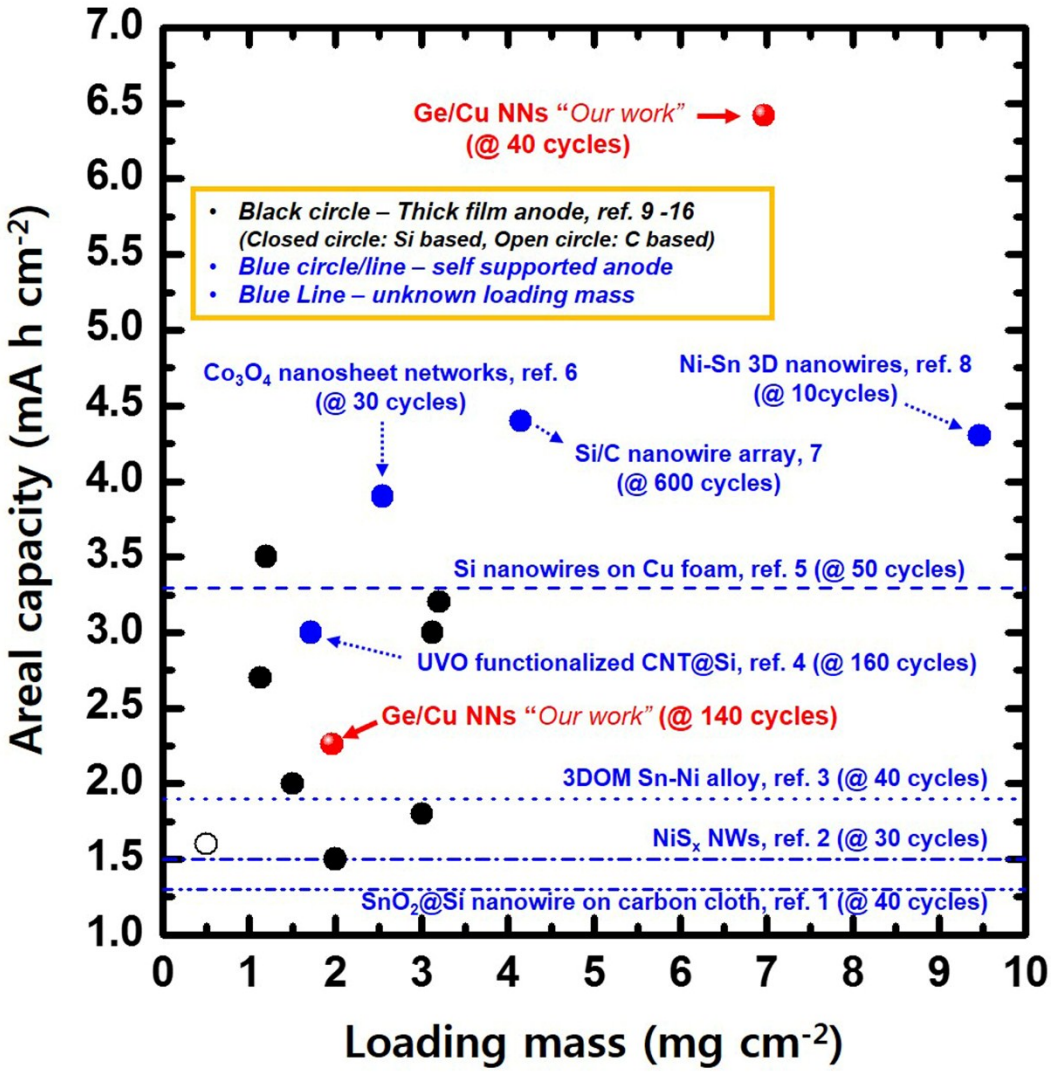


Fig. S10 Areal capacities of all anodes.

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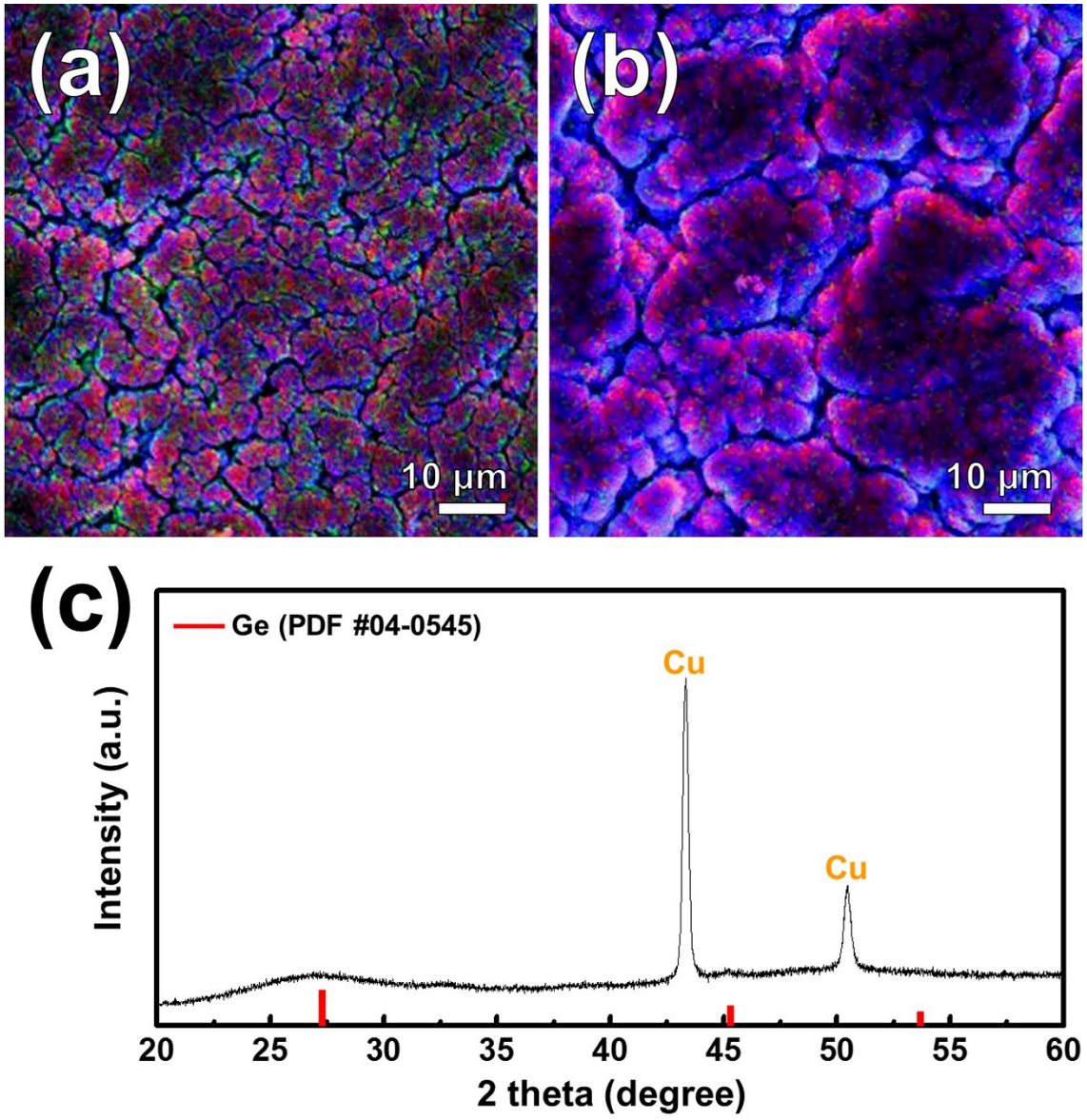

Fig. S11 EDS element color mixing mapping of the (a) low-mass electrode and (b) high-mass electrode, where the elements are distinguished by color: Ge (blue), O (red), and Cu (green). (c) Ex-situ XRD pattern of the high-mass electrode after 100th charge cycle.