**Supplementary information for:**

# Array Geometry Dictates Electrochemical Performance of Ge Nanowire Lithium Ion Battery Anodes

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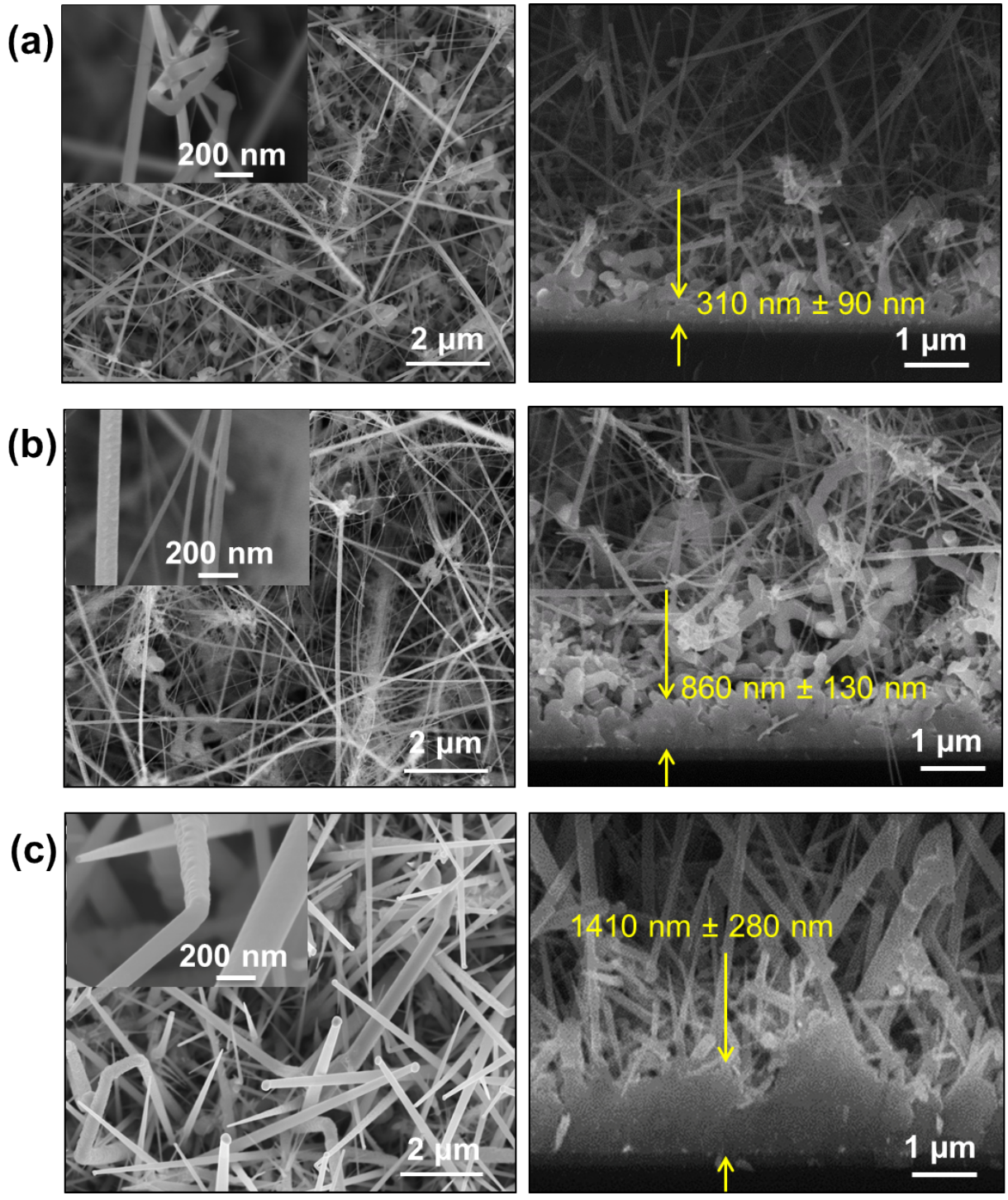


**Figure S1: Plan-view (left column) and cross-sectional (right column) SEM images of as synthesized nanowires. (a) 0.31mg-(320/5min); (b) 0.73mg-(320/10min); (c) 0.86mg-(360/10min). Parasitic Ge films, formed at the nanowire base during VLS, are indicated by arrows in cross-sectional images.**

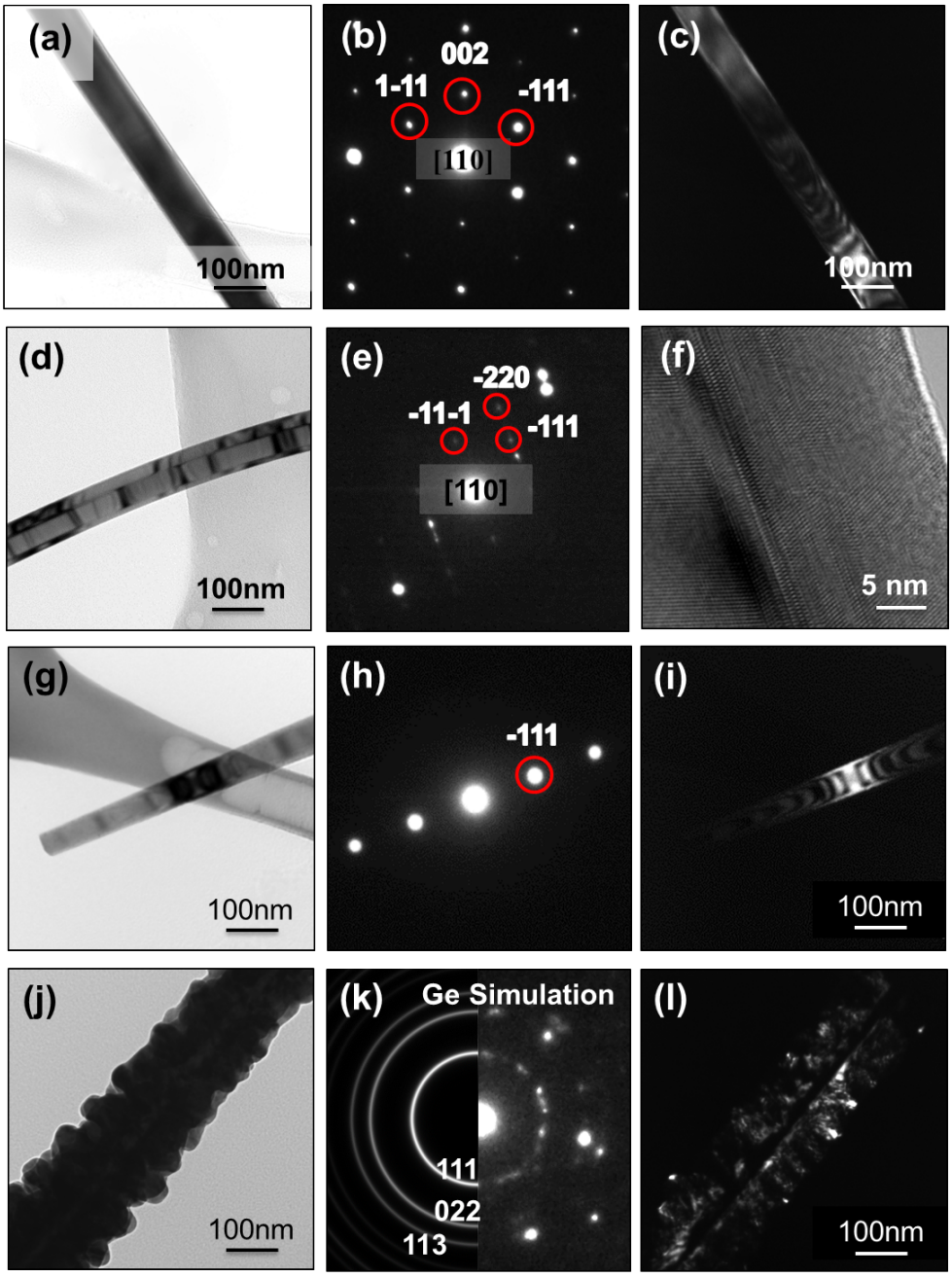


**Figure S2: (a) – (c) TEM analysis of 0.12mg-(320/2min); (a) bright field image of a single Ge nanowire; (b) SAD pattern confirming that it is single crystal; (c) dark field image taken using g = -111 reflection. (d) – (f) TEM analysis of 0.73mg-(320/10min); (d) bright-field image showing this nanowire to be multiply twinned along its length (e) SAD pattern streaked perpendicular to the twin interface f) HRTEM image showing a twin interface (g) – (l) TEM analysis of the near-top portion of a nanowire 0.86mg-(360/10min), showing the core single crystal. (j) – (l) TEM analysis of the near-base portion another nanowire in 0.86mg-(360/10min), showing the secondary nucleated Ge particles around the core. The dark field image in (l) was taken using a section of the 111 ring pattern.**

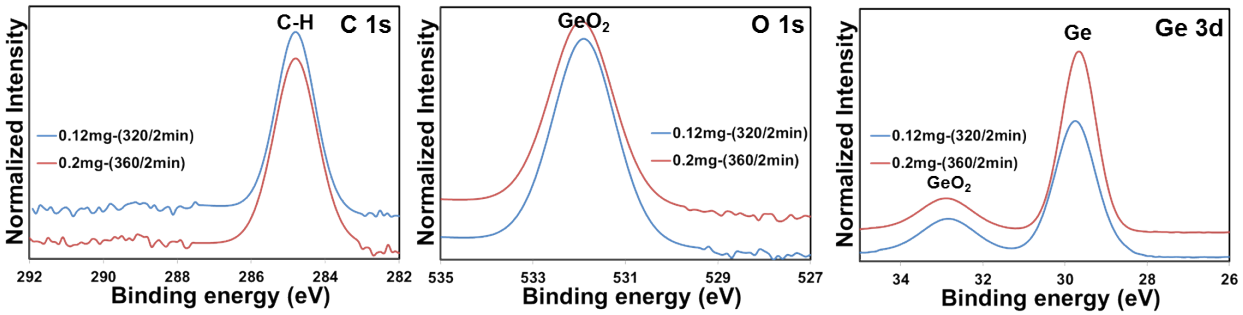


**Figure S3: High resolution XPS spectra of C 1s, O 1s, and Ge 3d of as-synthesized 0.12mg-(320/2min) and 0.2mg-(360/2min) electrodes.**

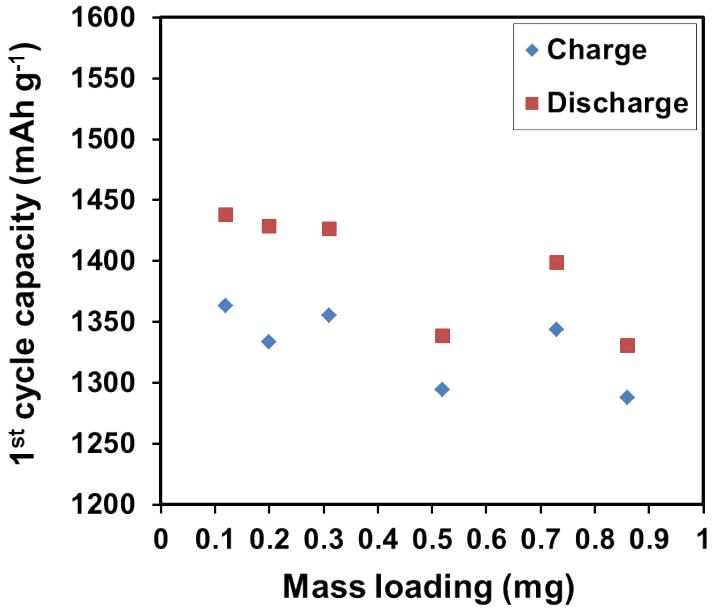


**Figure S4: First cycle charge and discharge capacities versus cycle number, tested at 138 mAh $g^{-1}$.**

**Table S1: shows a comparison of the initial CE for literature published graphite and related materials - based LIB anodes.**

| Electrodes | Initial Coulombic Efficiency (%) (current rate or density) |
|---|---|
| Graphite flakes [1] | ~92 (0.5C) |
| Graphite [2] | ~93 (0.33C) |
| Graphite with Stabilized Lithium Metal Powder [2] | ~100 (0.33C) |
| graphite/microfibrillated cellulose [3] | ~75 (0.1C) |
| $ZnFe_2O_4$/Flake Graphite Composite [4] | 87.7 (100 mA $g^{-1}$) |
| Spherical natural graphite/ PVDF binder [5] | ~88.5 (70 $mAg^{-1}$) |
| Spherical natural graphite/ CMC/SBR binder [5] | ~90.3 (70 $mAg^{-1}$) |
| Spherical natural graphite/ PAA binder [5] | ~90.1 (70 $mAg^{-1}$) |
| Spherical natural flake graphite [6] | ~91.3 (0.2C) |
| Mildly expanded graphite [6] | ~84.4 (0.2C) |
| Ultrathin Graphite Foam [7] | ~94 (190 $mAg^{-1}$) |
| Graphene/SWNT Hybrid Foam [7] | ~98 (190 $mAg^{-1}$) |
| Pristine Graohite [8] | ~94 (0.05C) |
| $Li_4Ti_5O_{12}$-coated Graphite [8] | ~88 (0.05C) |
| Graphite-anchored lithium vanadium oxide [9] | 79 (0.1C) |
| Graphite [10] | ~89 (50 $mAg^{-1}$) |
| graphite/silicon/graphene spherical composite [10] | ~74.5 (50 $mAg^{-1}$) |
| Commercial Graphite [11] | ~86 (0.1C) |


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