

Supporting Information

Germanium Sulfide Nano-Optics Probed by STEM-Cathodoluminescence Spectroscopy

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Supporting Figures

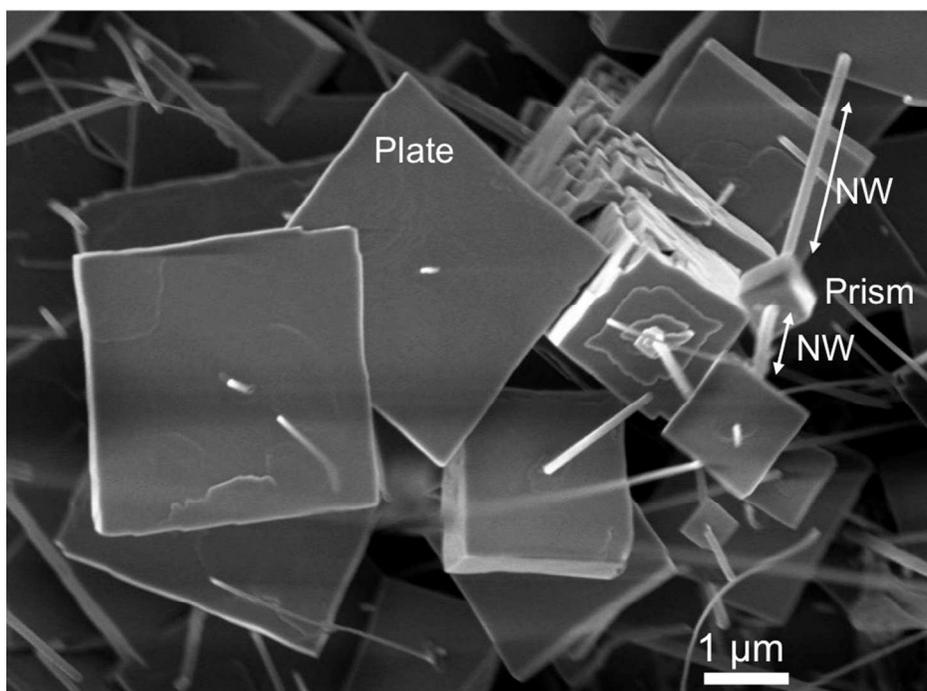


Figure S1 – Scanning electron microscopy (SEM) on micrometer sized GeS prisms and plates synthesized by vapor transport growth using sublimation of a GeS precursor. The smaller GeS prisms are typically sandwiched between segments of vapor-liquid-solid grown GeS nanowires. The larger plates are often thinner and show short, thin sections of GeS nanowires only on one face.

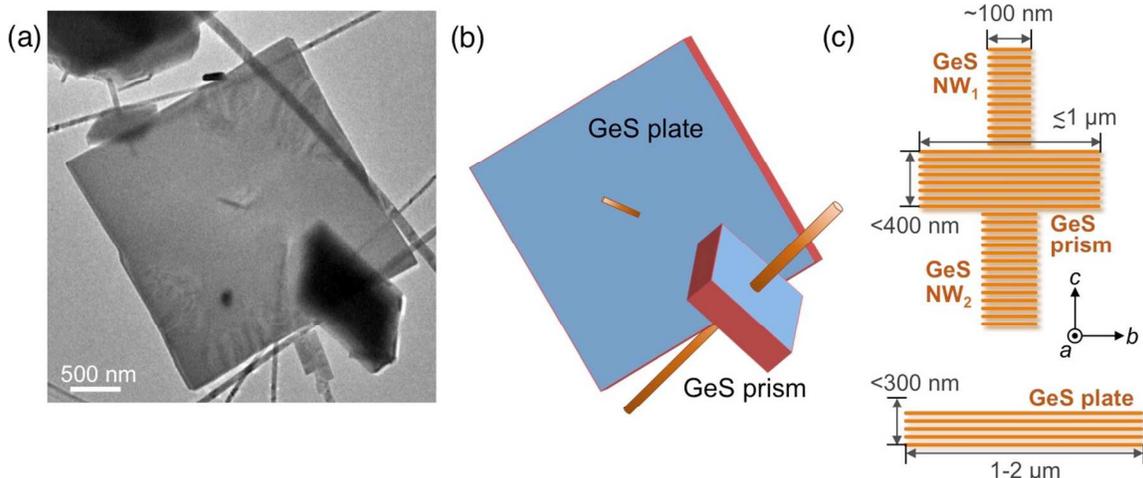


Figure S2 – Transmission electron microscopy (TEM) of GeS plates and prisms. (a) TEM image of a large, thin GeS plate and an adjacent GeS prism. Note the attached GeS nanowire segments. (b) Schematic drawing and identification of plate and prism. (c) Schematic representation of the crystallography and typical dimensions of the GeS prisms and plates.

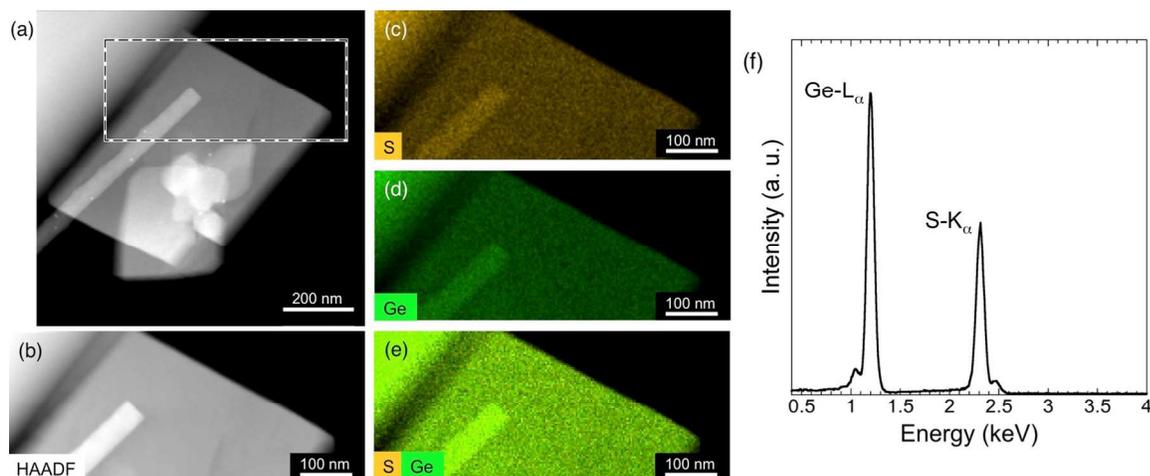


Figure S3 – Chemical analysis by energy-dispersive X-ray spectrometry (EDS). (a) High-angle annular dark field (HAADF) STEM image of a GeS plate. (b) HAADF-STEM image of the area outlined in (a). (c) EDS sulfur map, (d) germanium map, and (e) overlay of both S and Ge signals. (f) EDS spectrum showing Ge-L $_{\alpha}$ and S-K $_{\alpha}$ with an intensity ratio corresponding to GeS.

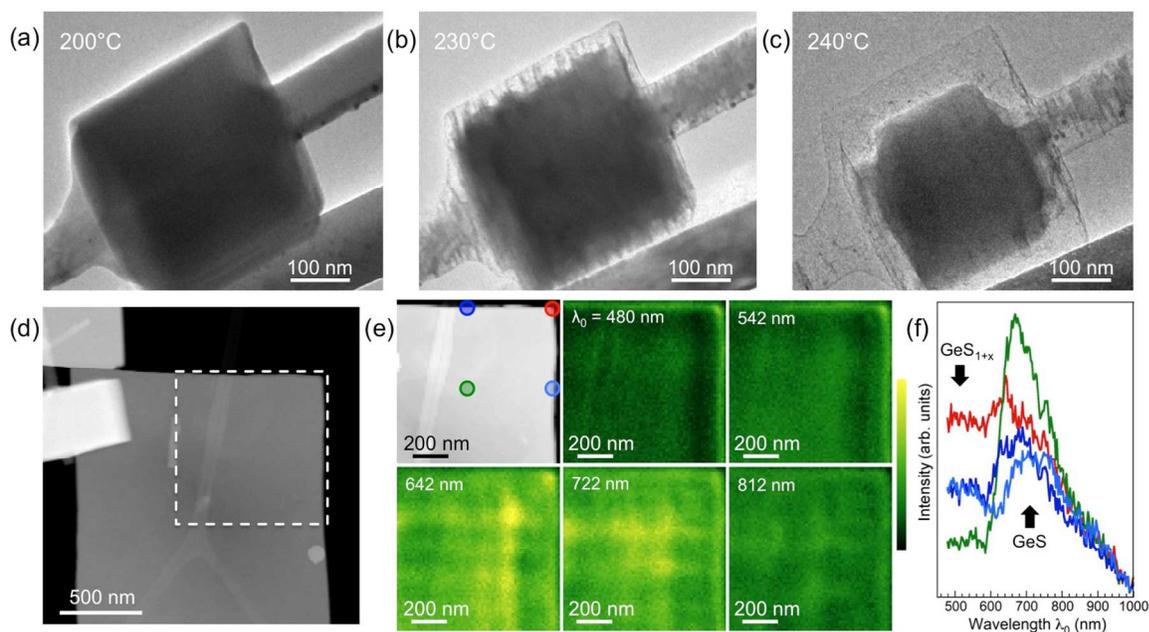


Figure S4 – Identification of ultrathin S-rich (GeS_{1+x}) shells surrounding GeS prisms and plates. (a)-(c) *In-situ* TEM images obtained during annealing of a GeS nanoprism sandwiched between GeS nanowires. Note the decomposition of the prism from the edge due to GeS sublimation at temperatures above $\sim 230^\circ\text{C}$, which leaves behind an ultrathin cage of more thermally stable, S-rich GeS_{1+x} , similar to previous findings for GeS nanowires (ACS Applied Nano Mater., 2018, 1, 1042-1049). (d) HAADF-STEM image of a large GeS plate. (e) HAADF-STEM image and monochromatic CL maps (at indicated wavelengths λ_0) of the area marked in (d). Note the emission predominantly from the plate edge at short wavelengths $\lambda_0 < 550$ nm. (f) Local CL spectra obtained at points marked in the STEM image in (e). Spectra measured at the corner and edges show an increased intensity at short wavelengths compared to the GeS band-edge emission.