

# Suppressed electronic contribution in thermal conductivity of $\text{Ge}_2\text{Sb}_2\text{Se}_4\text{Te}$

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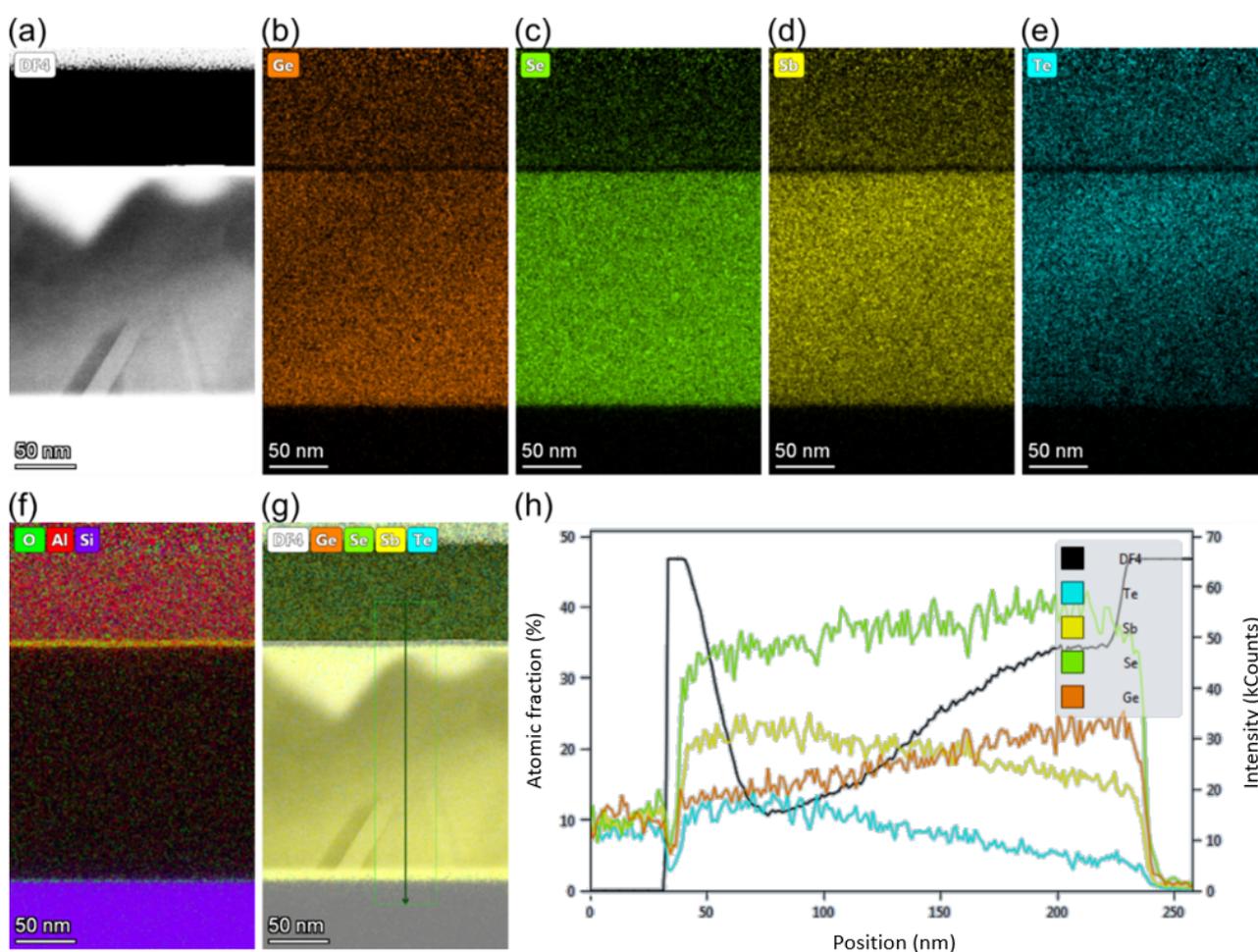
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## Supplementary Note 1

STEM-EDS was performed using a 400 pA beam current and the results are shown in Figure S1. The annular darkfield image in Figure S1(a) shows multiple equiaxed and non-equiaxed grains. The composition of the various grains do not have differing compositions in anyway correlated to the morphologies in the darkfield signal, as shown in Figure S1(b-e). A compositional gradient is present across the thickness of the films, as shown in Figure S1(h). The gradient may in part be from x-ray absorption affects that are thickness dependent or could be a result of growth conditions. It is striking that such a large gradient is present, and the gradient may explain the preferential non-equiaxed grain morphology being present at the bottom of the film and not the top.



**Supplementary Figure 1.** STEM-EDS spectrum image with (a) diffraction contrast from an annular darkfield detector showing multiple grains with uniform (b) Ge, (c) Se, (d) Sb, and (e) Te compositions. Observation of signatures of other elements in the Al transducer is associated with the noise in the system and artifact of measurement. The Si and Al layers are shown in (f) along with thin oxides present at each interface. The composite image of (a-e) is shown in (g), where a line profile is indicated. The quantitative compositions along the line profile are shown in (h).

