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Supporting Information

Enhanced Pseudo-Atomic Layer Deposition of Antimony Telluride Thin Films by Co-injecting NH_3 Gas with Both Precursors

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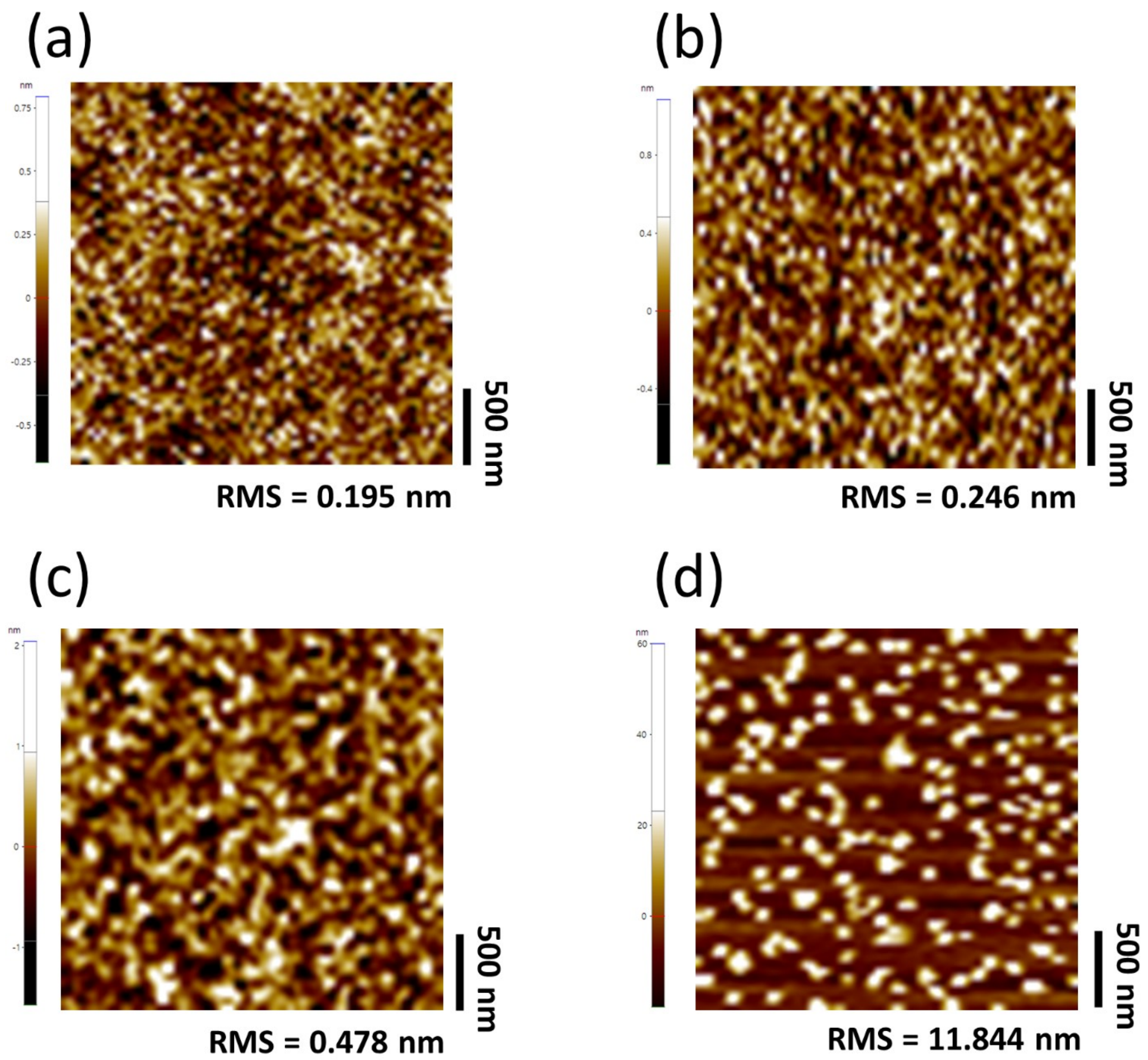

Fig. S1 AFM images of films grown by the "Sb only" process on (a) SiO_2 and (b) TiN substrate. AFM images of films grown by the "Te after Sb" process on (c) SiO_2 and (d) TiN substrate.

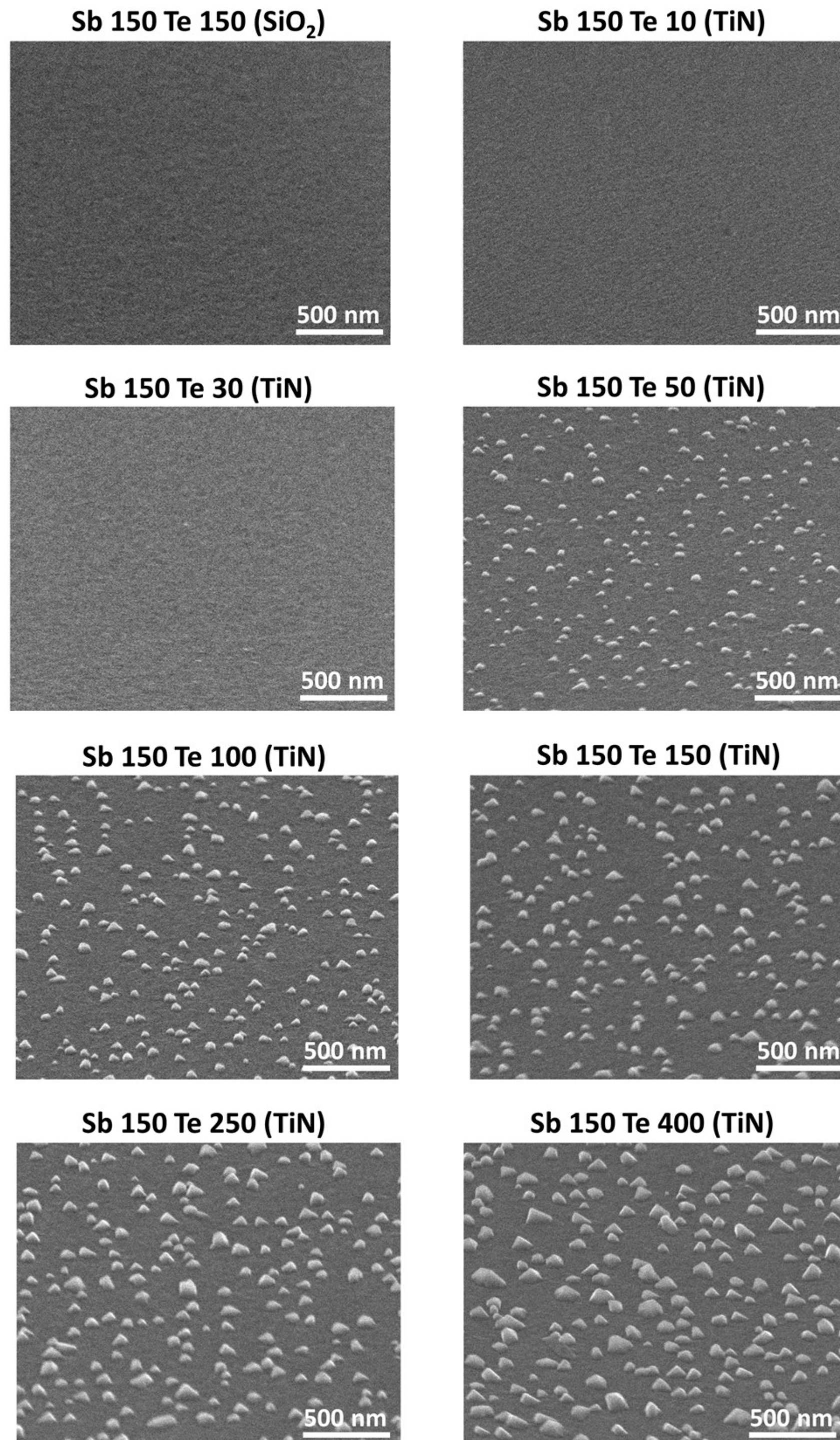

Fig. S2 Bird's eye-view SEM images (60° tilted from surface-normal direction) of the films deposited by the "Te after Sb" process. The number of

“Te only” cycles was varied after a fixed 150 “Sb only” cycles.

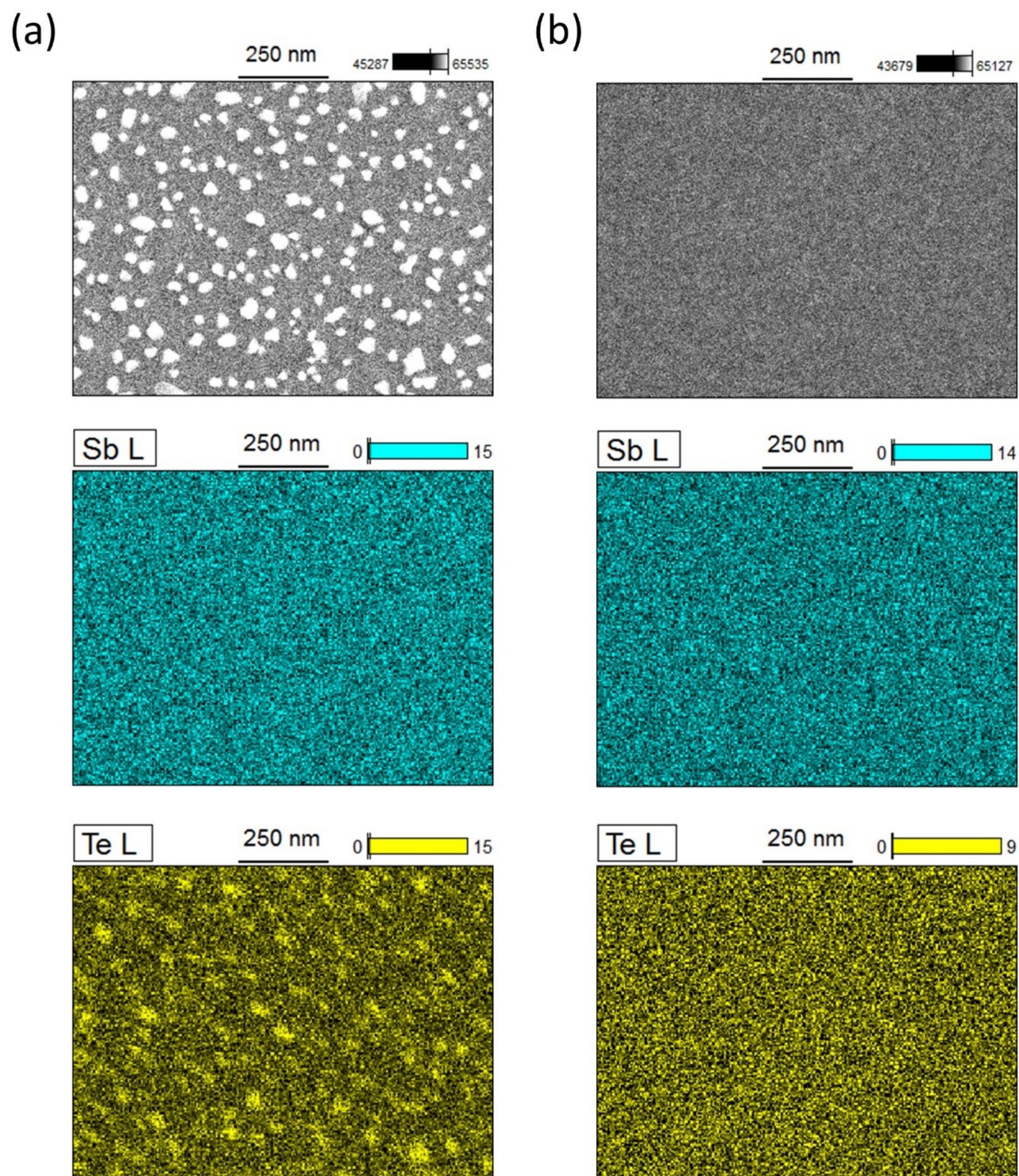

Fig. S3 SEM-EDS images of films deposited by the “Te after Sb” process on (a)

TiN and (b) SiO_2 substrate.

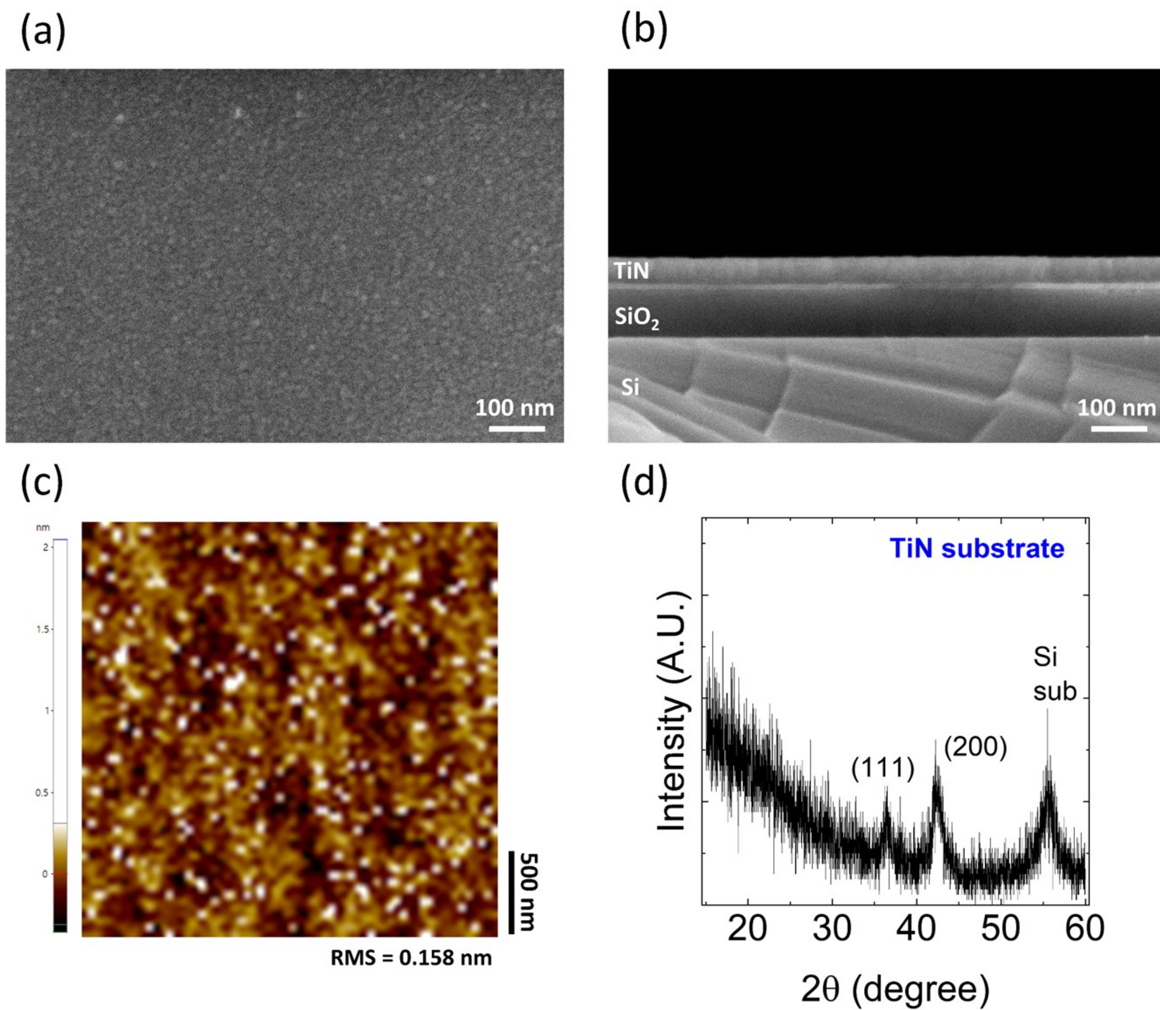

Fig. S4 (a) Top-view SEM, (b) cross-sectional SEM, (c) AFM image, and (d) GAXRD pattern of the TiN substrate. The TiN substrate displayed the typical columnar grains in sputtered TiN[1] with a grain diameter of ~10 nm. The RMS roughness of the TiN substrates (0.158 nm) was higher than that of the SiO_2 substrate (0.081 nm). The GAXRD pattern indicates that the TiN substrate does

not possess a preferred orientation.

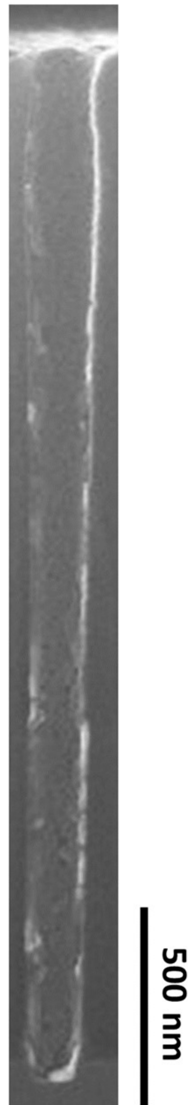

Fig. S5 Cross-sectional SEM image of the Sb_2Te_3 film deposited on a high-

aspect-ratio (29:1) hole structure.

References

1. L. Zhang, H. Yang, X. Pang, K. Gao and A. A. Volinsky, *Surface and Coatings Technology*, 2013, **224**, 120-125.