**Supporting Information**

# In-situ TEM Observation of Heterogeneous Phase Transition of a Constrained Single-crystalline $Ag_2Te$ Nanowire

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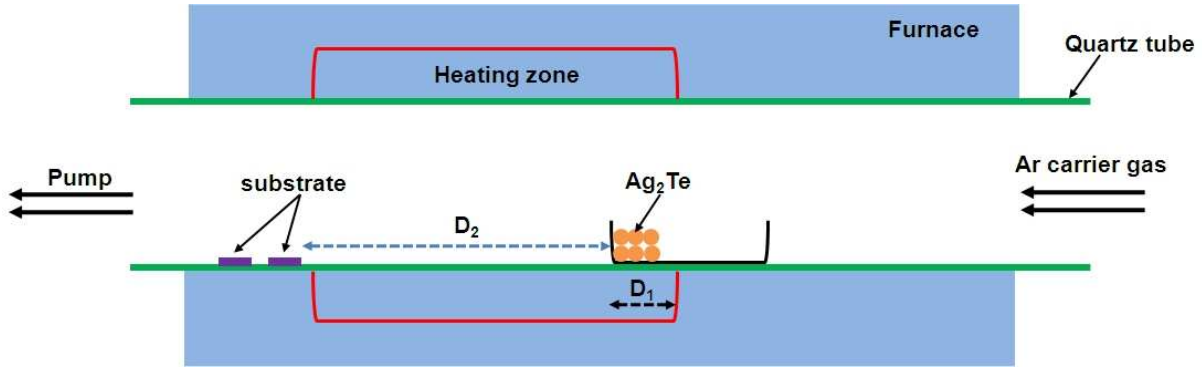


**Scheme S1:** Experimental setup for $Ag_2Te$ NW synthesis. Sapphire substrates were placed about 12 cm from the precursor ($D_1$ ~ 1.5 cm, $D_2$ ~ 12 cm).

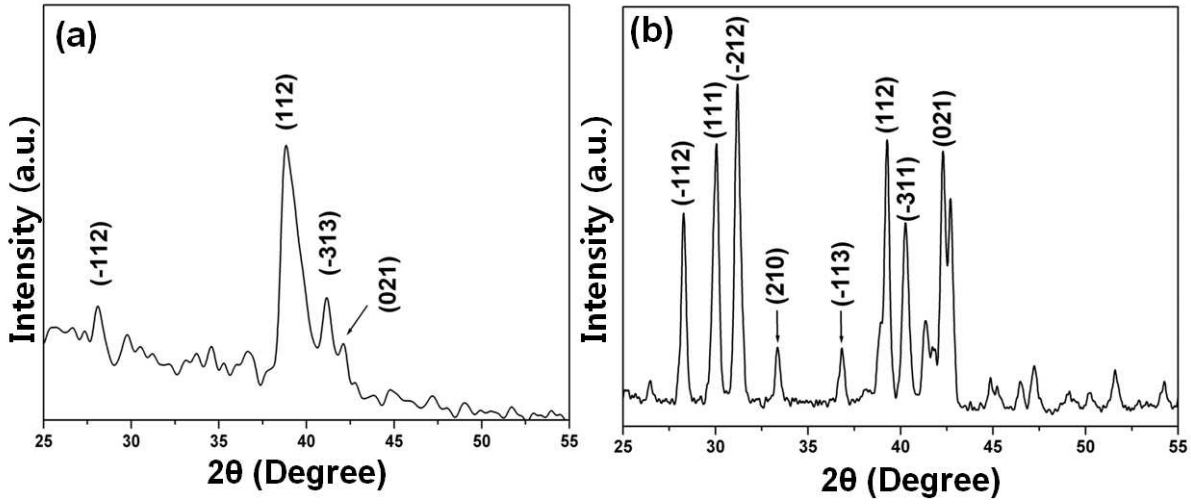


**Figure S1.** (a,b) XRD patterns of epitaxially grown and freestanding $Ag_2Te$ NWs, respectively, with a monoclinic crystal structure (JCPDS card no. 81-1985).

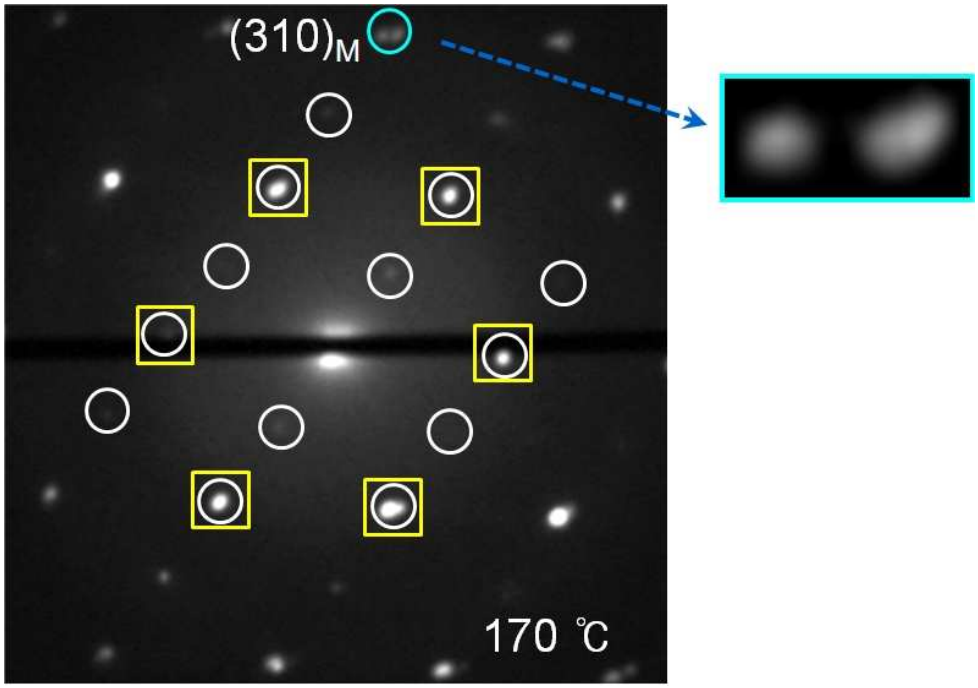


**Figure S2.** In-situ SAED pattern obtained during heating at temperatures of 170 ℃ as shown in Figure 2c. The split $(310)_M$ spot is magnified separately in this pattern. [M: monoclinic, white circle: monoclinic spot, yellow square: FCC spot]

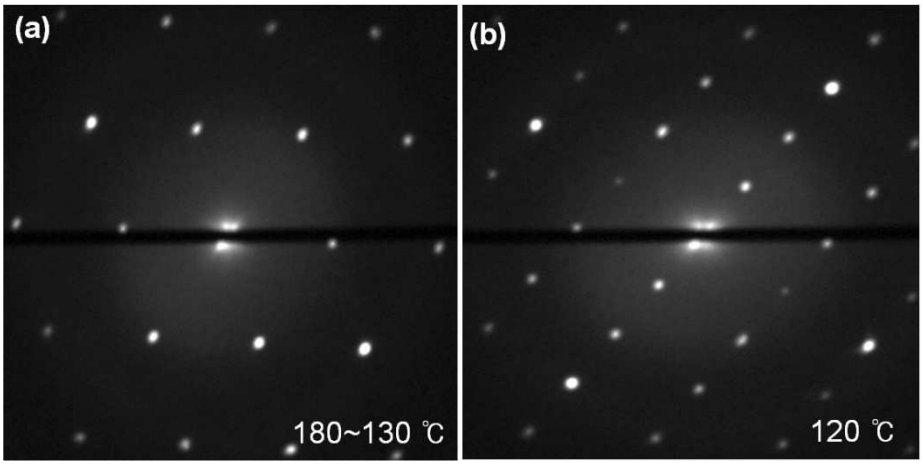


**Figure S3.** In-situ SAED patterns of a freestanding $Ag_2Te$ NW obtained during cooling at (a) 180~130 ℃ and (b) 120 ℃.

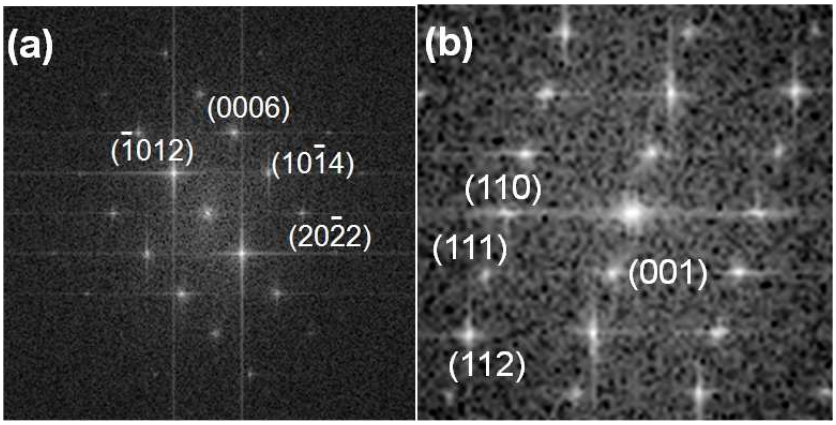


**Figure S4.** (a,b) The corresponding FFT patterns of a sapphire substrate and the $Ag_2Te$ NW, respectively, in Figure 3b.

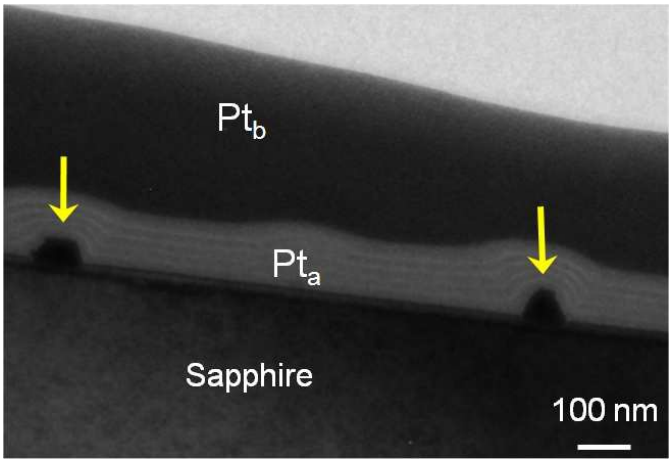


**Figure S5.** Low-resolution TEM image of the cross-sectional lamella enclosed with a sapphire substrate and Pt layers. Yellow arrows indicate the cross-sections of $Ag_2Te$ NWs. [Cross-section thickness: ~100 nm, $Pt_a$: Electron beam assisted deposition, $Pt_b$: ion beam assisted deposition]

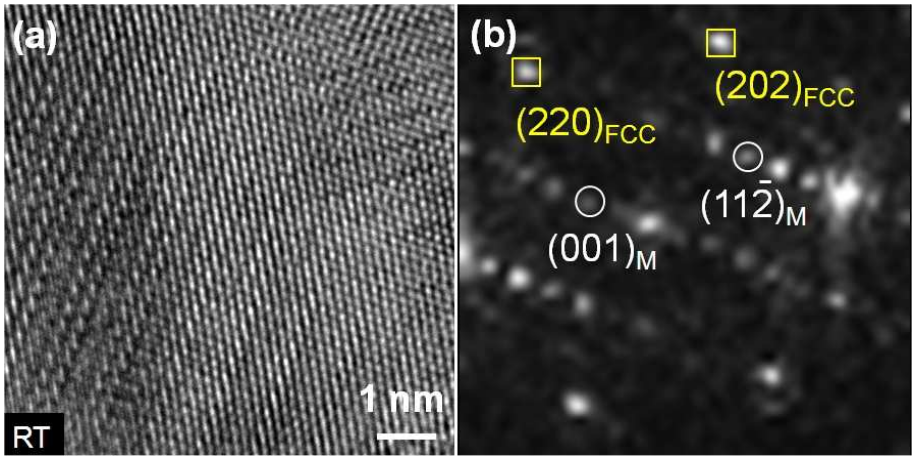


**Figure S6.** (a,b) In-situ HRTEM image and the corresponding FFT pattern obtained after cooling down to RT. It exhibits the coexistence of FCC and monoclinic phases. [M: monoclinic, white circle: monoclinic spot, yellow square: FCC spot]

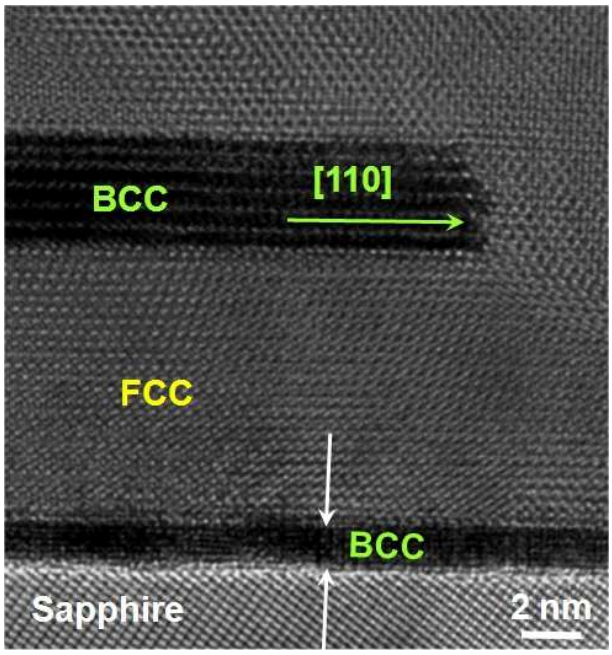


**Figure S7.** In-situ HRTEM image of the interface between the NW and sapphire substrate showing ongoing phase transition at 200 ℃. It displays the formation and the propagation of the BCC phase within the FCC matrix.