Supplementary data

Synthesis of $ZnS/Al_2O_3/TaSe_2$ core/shell nanowires using thin Ta metal film precursor

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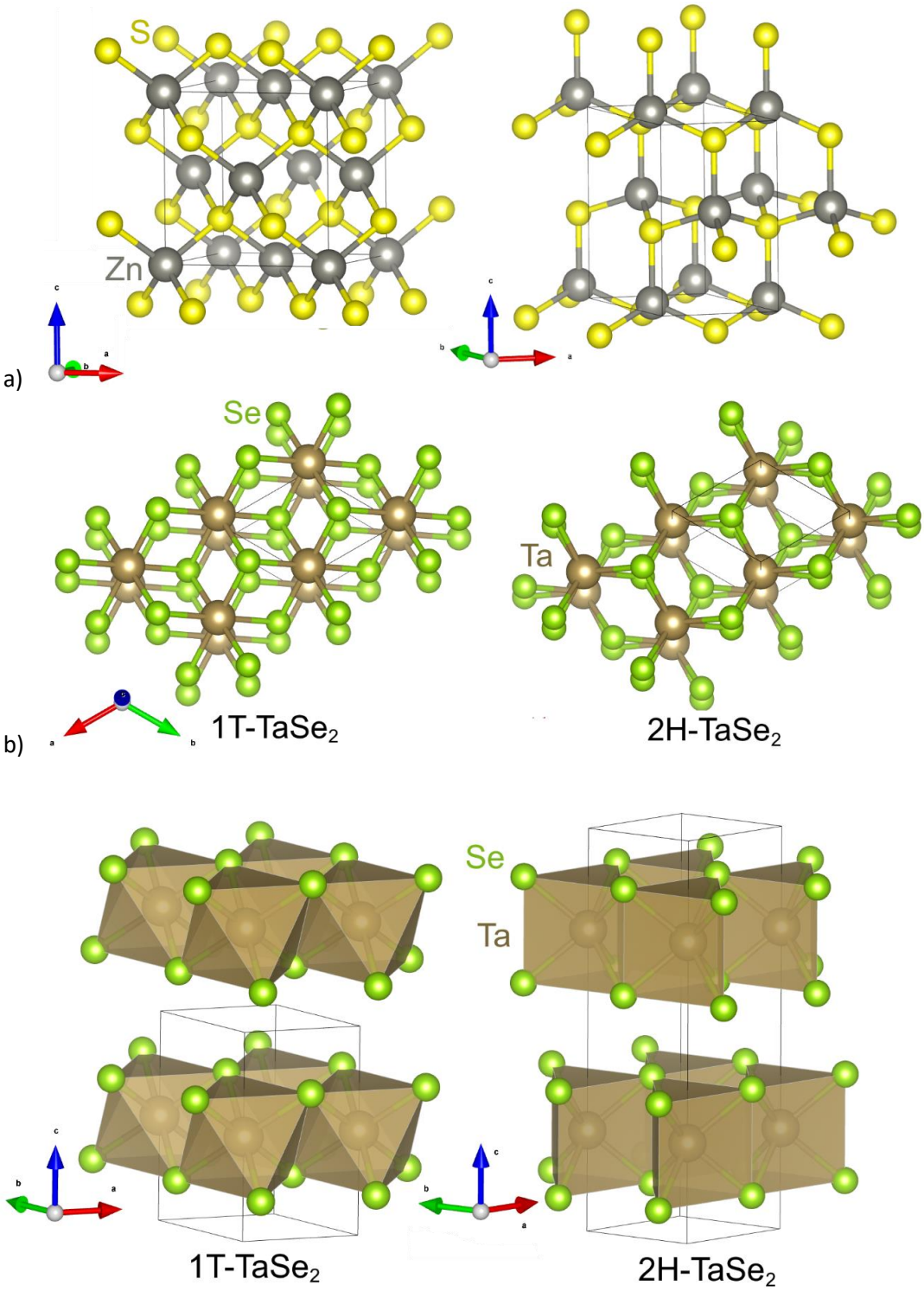

Figure S1. *Visual representation of crystal structure of ZnS zincblende (a, left panel) and wurtzite (a, right panel), as well as 1T-$TaSe_2$ and 2H-$TaSe_2$ (top view in (b) and side view in (c)). Atomic environment of Se atoms around Ta is shown in (c) for better explanation. Unit cell for each structure is shown with black polyhedral. 1T-$TaSe_2$ has a trigonal D_{3d} space group symmetry, where each Ta atom is octahedrally coordinated by six Se atoms. 2H-$TaSe_2$ is a more stable phase and has a D_{6h} space-group symmetry, where each Ta atom is coordinated by six Se atoms in a trigonal prismatic arrangement. For 1T-$TaSe_2$ cells is doubled in z--direction for better comparison between both phases of $TaSe_2$.*

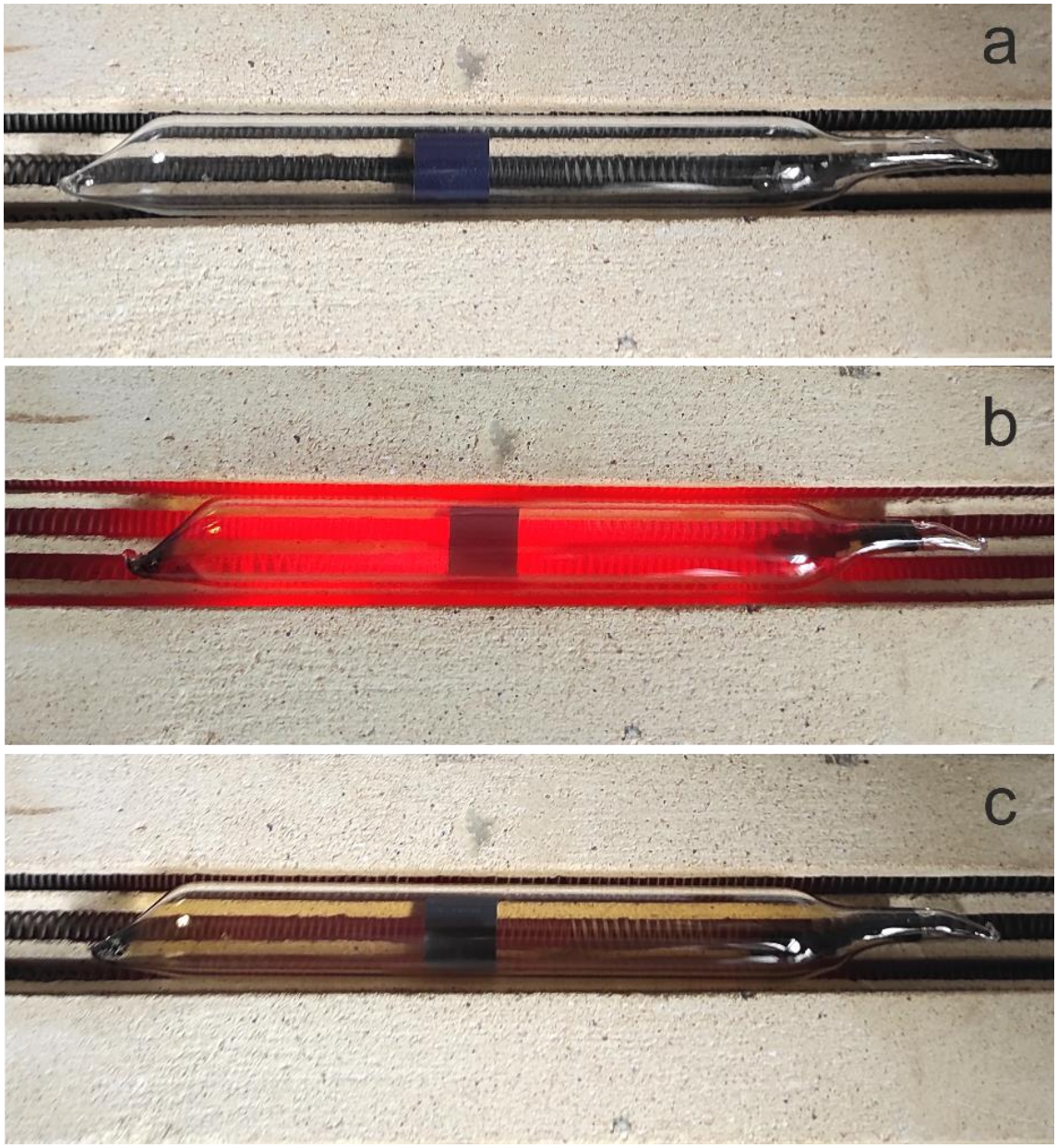

***Figure S2**. Selenization of Ta thin film and $ZnS/Al_2O_3/TaSe_2$ NWs on Si/SiO_2 substrate in quartz ampoule. Images before ampoule heating (a), during ampoule heating (b), during cooling (c).*

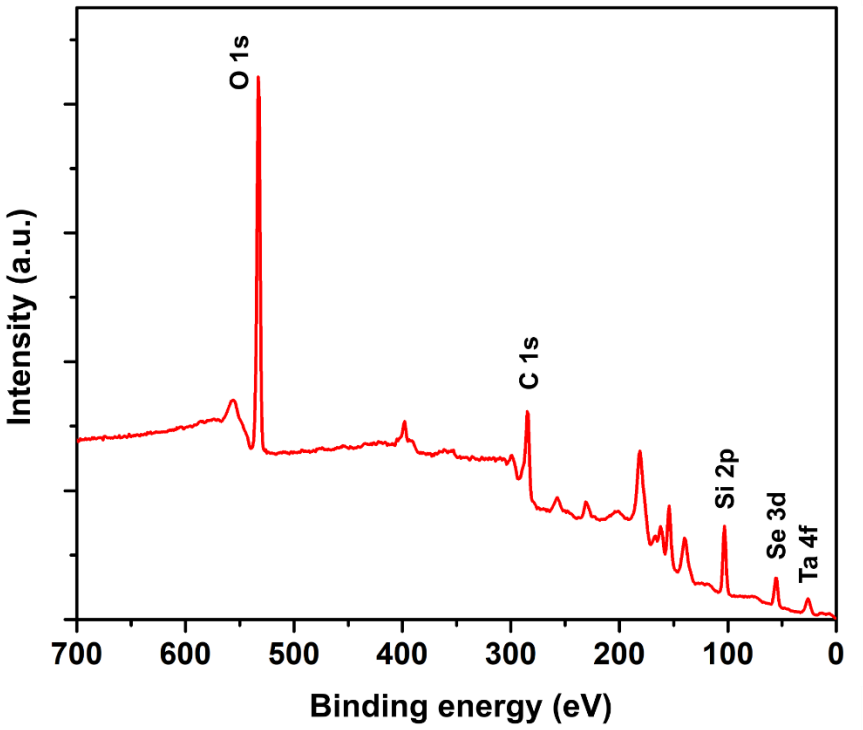

***Figure S3**. XPS survey scan for $ZnS/Al_2O_3/TaSe_2$ NWs on Si/SiO_2 substrate. The characteristic peaks of all elements present on the sample surface are marked correspondingly.*

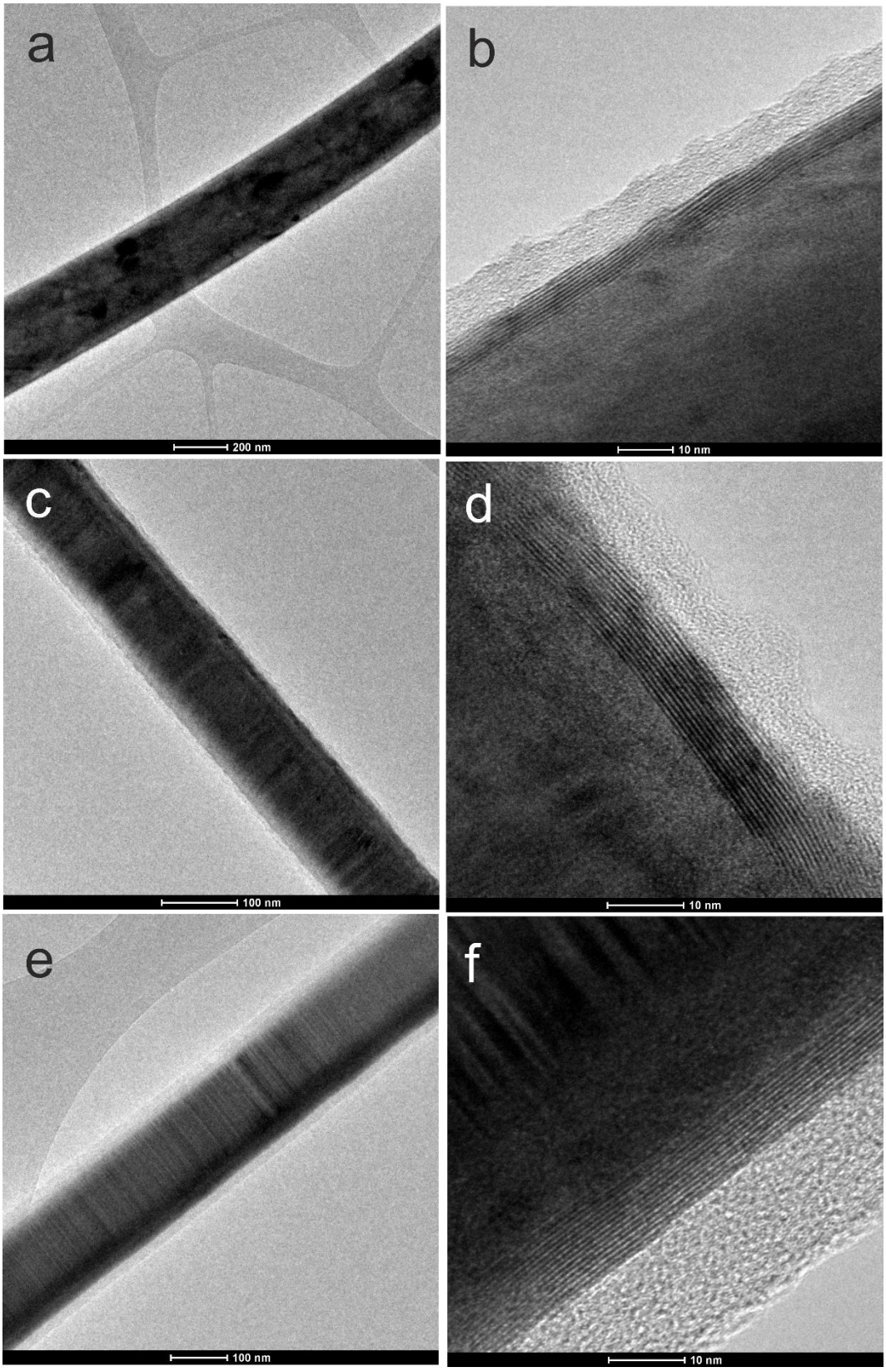

***Figure S4**. TEM images of $ZnS/Al_2O_3/TaSe_2$ NWs at low (a, c, e) and high (b, d, f) magnifications.*

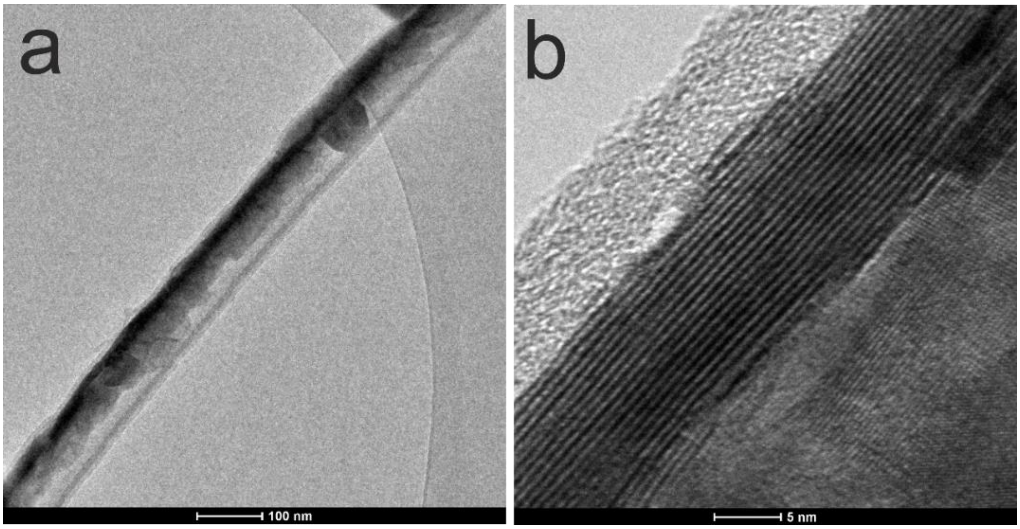

***Figure S5**. TEM images of $ZnO/Al_2O_3/TaSe_2$ NWs at low (a) and high (b) magnifications. ZnO NW core was sublimated and $TaSe_2$ shell cover Al_2O_3 empty "tube".*