Controllable Synthesis and Quantum Transport Properties of Bi_2Se_3 Topological Insulator Nanostructures

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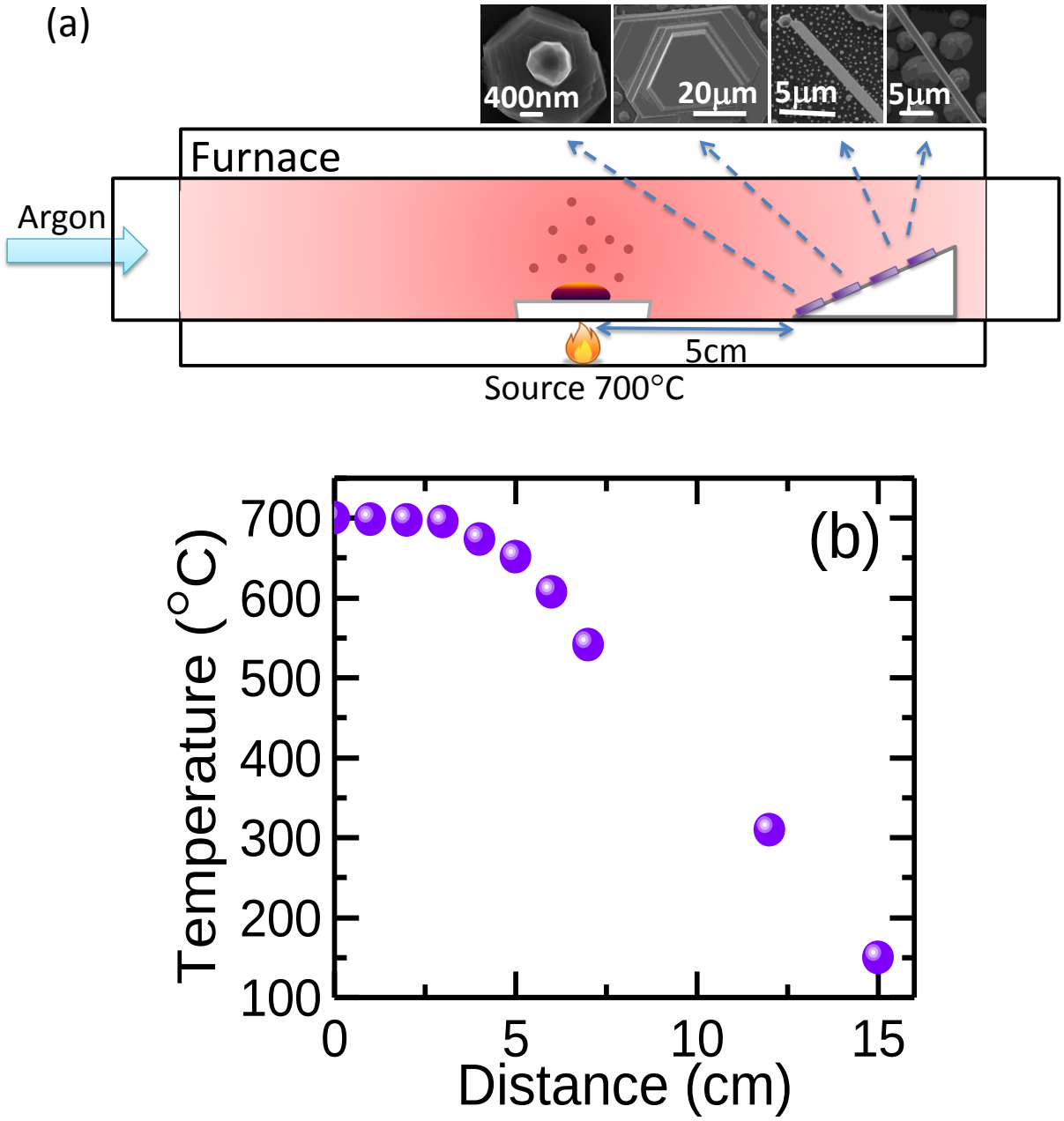

Figure S1. (a) Schematic diagram of the tube furnace and the CVD method. Bi_2Se_3 powders were placed in the center of the tube and used as source materials. Silicon substrates with electron beam evaporated gold thin layer were placed downstream of the source with an angle of about 30 degree to the horizontal to collect the products. The Bi_2Se_3 nanostructures with different morphologies were obtained at the substrates away from the source with different distances. (b) The temperature distribution in the furnace relative to the central temperature of 700 ^{o}C.

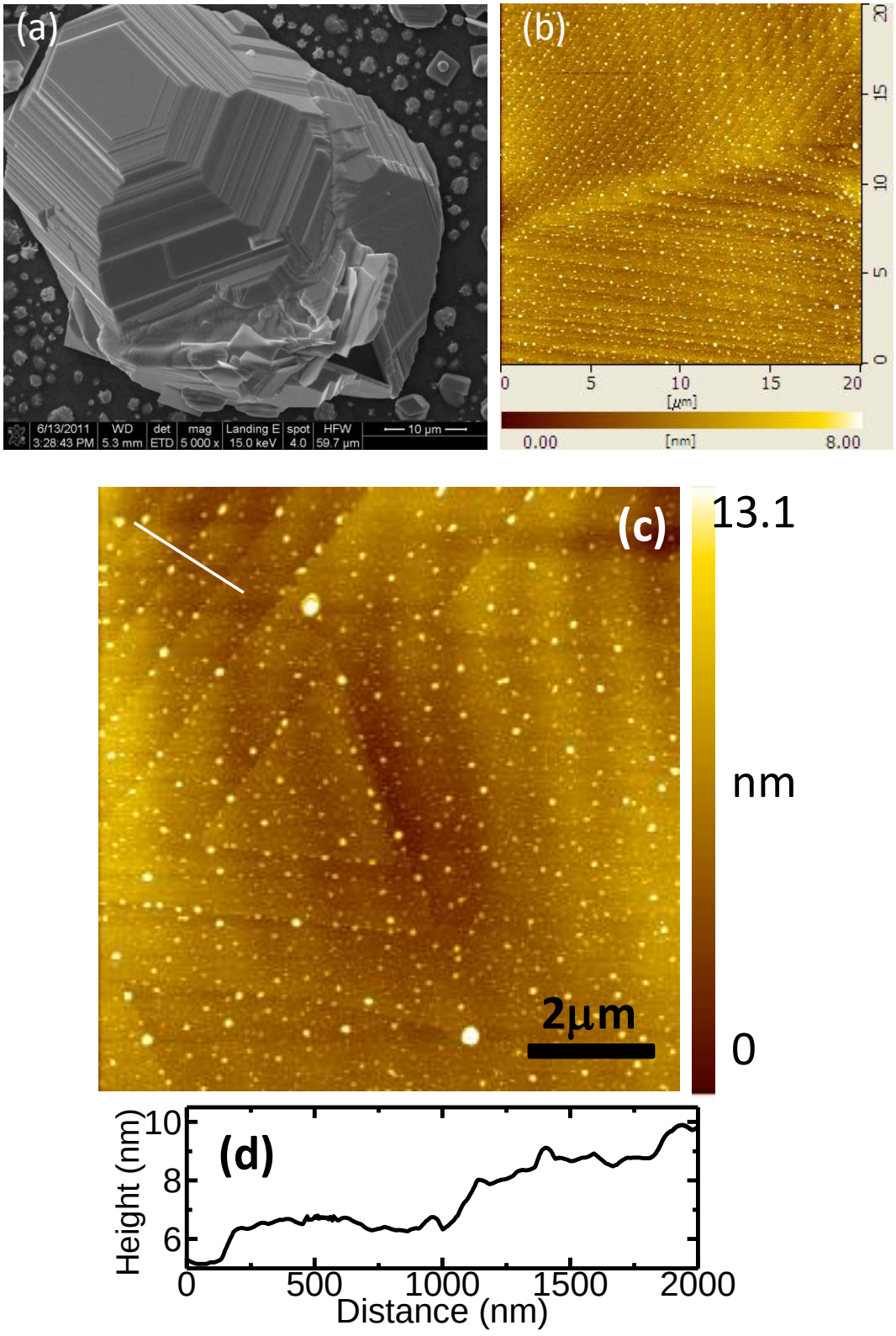

Figure S2. (a) SEM image shows the layered character of the synthesized Bi_2Se_3 nano-structures. (b,c) AFM images show the spirals of Bi_2Se_3 nano-plate. (d) The AFM line profile analysis shows the step height ~1 nm.

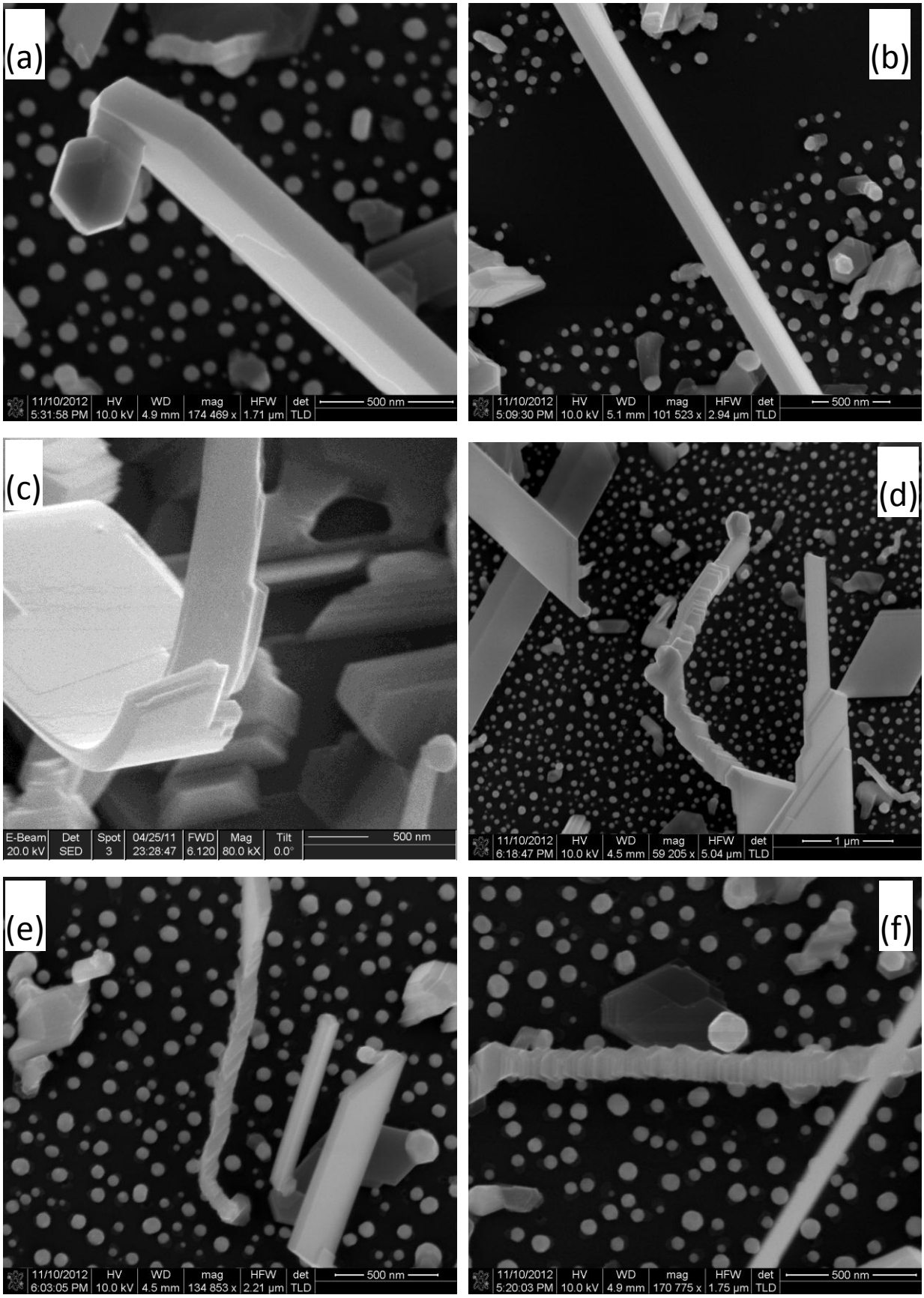

Figure S3. SEM images of the as grown Bi_2Se_3 nanostructures.

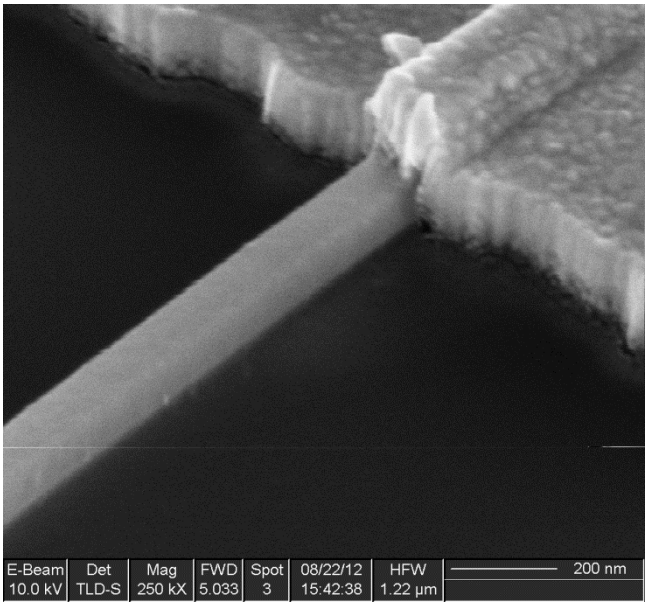

Figure S4. SEM image of a typical nanobeam device as the sample stage was tilted 52^{o}.

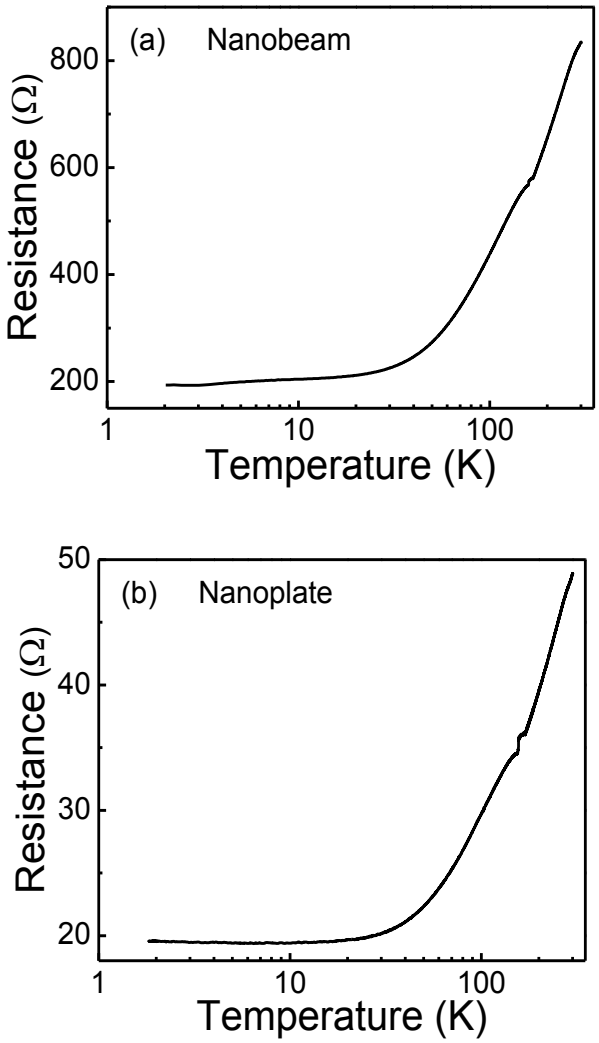

Figure S5. The temperature dependent resistance of (a) Bi_2Se_3 nanobeam and (b) Bi_2Se_3 nanoplate.

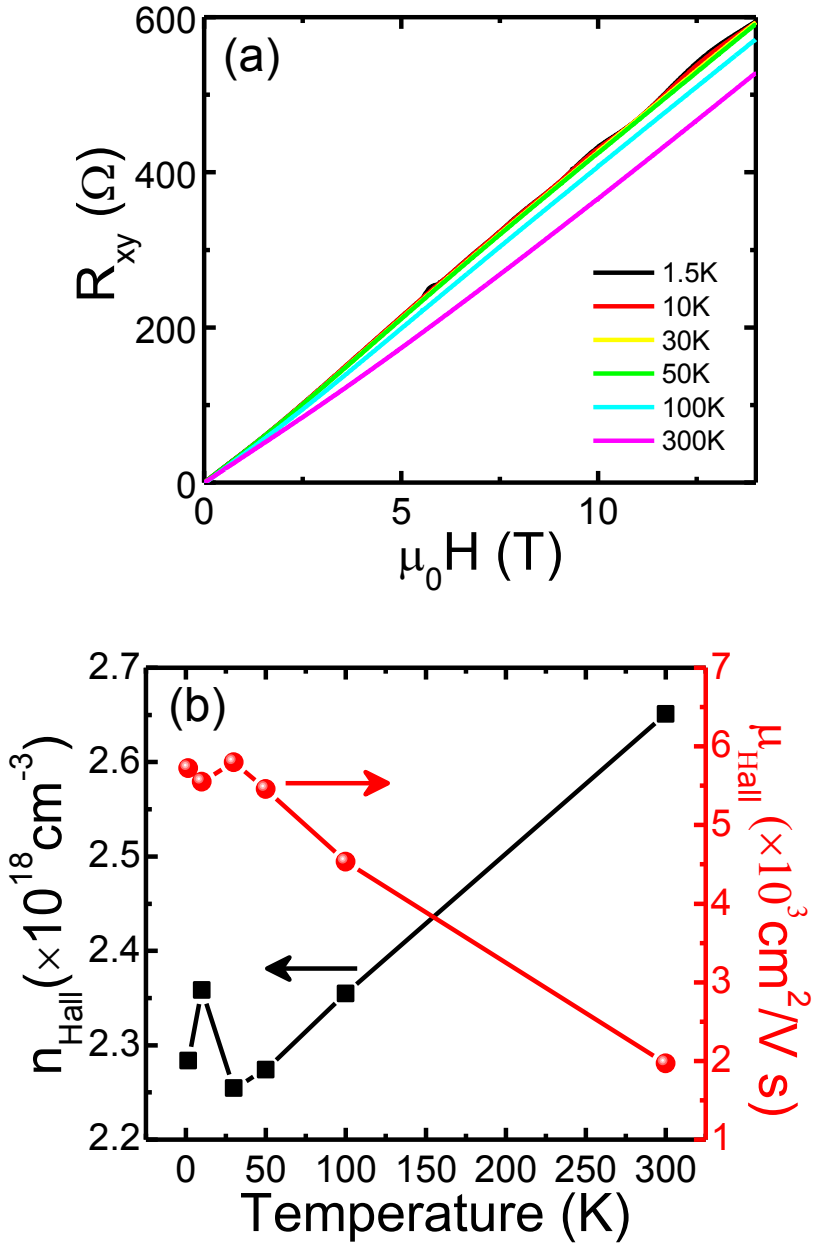

Figure S6. (a) The R_{xy} of nanoplate as a function of magnetic field at different temperatures. By fitting the R_{xy}-B curves in low field region (<1 T), the carrier concentration n_{Hall} and Hall mobility μ_{Hall} as a function of temperature are plotted in (b).

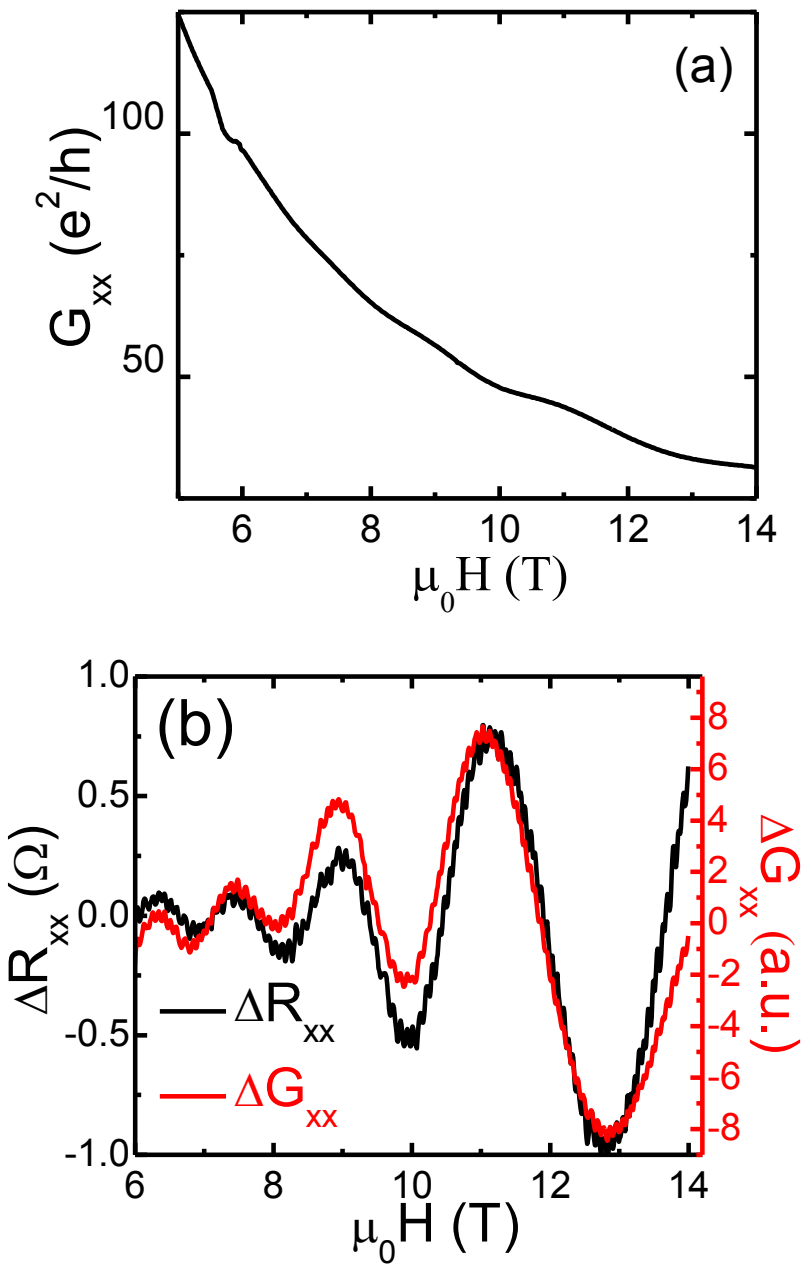

Figure S7. (a) The G_{xx} (obtained from $G_{xx} = R_{xx}/[R_{xx}^2 + R_{xy}^2]$) of the Bi_2Se_3 nanoplate as a function of magnetic field. (b) The SdH oscillations were represented as $\Delta G_{xx} \sim B$ and $\Delta R_{xx} \sim B$, respectively. The minima in G_{xx} are well consistent with the minima in R_{xx} at high magnetic field.

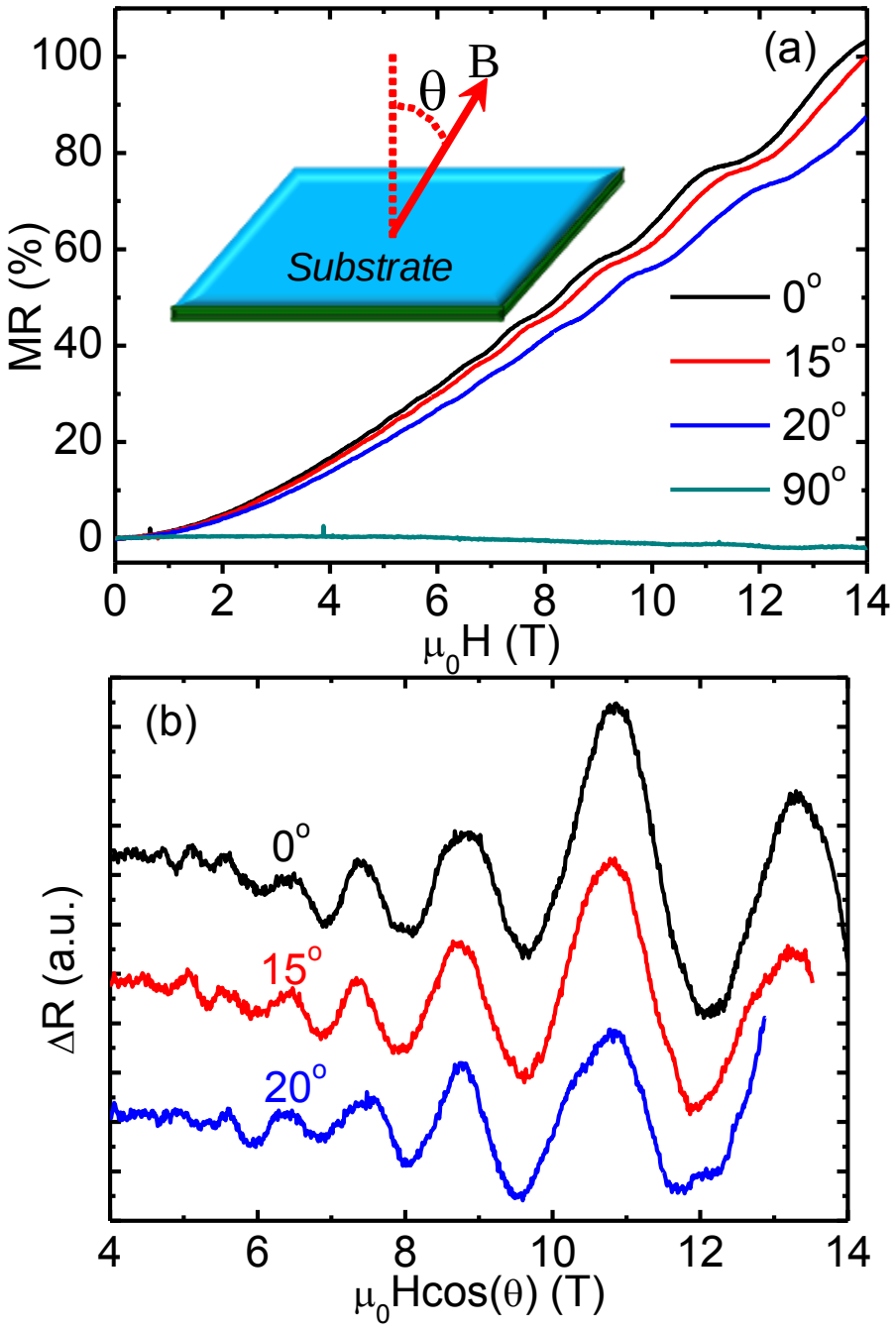

Figure S8. (a) The magnetoresistance measured at temperature of 1.5 K with different angles between the normal direction of the substrate plane and the direction of the magnetic field (see the sketch map in the inset). (b) The SdH oscillations in resistance as a function of the vertical component of the magnetic field.