Solvothermal Synthesis, Stirring-assist Assemble and Photoelectric Performance of Te Nanowires

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Supplementary Information

1. Further description of XRD analysis.

Figure 1A shows a high-magnification FESEM image of the Te NWs. The morphology of the nanowires is of hexagonal cross section.

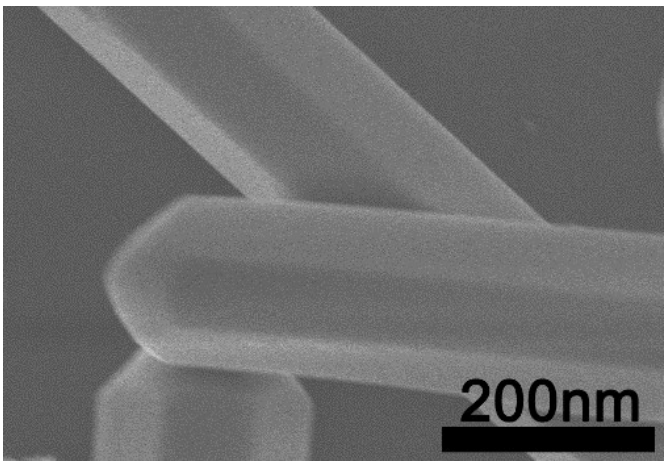

Figure 1A High-magnification FESEM image of the Te NWs.

During the XRD analysis, the Te NWs were dispersed in ethanol to form a homogeneous suspension. After casting of the suspension onto a glass substrate and dried for 20 minutes in a vacuum oven at 60 °C, a dark blue film was obtained. In this case, most of NWs are tiled on the substrate, but not perpendicular to the substrate. Moreover, in our manuscript, the HRTEM image and ED pattern of a single Te NW revealed that the as-prepared NWs were perfect single crystalline with a growth direction along [0001]. That is to say, the axial direction of the NW is along the [0001] direction (i.e., the z direction in Figure 1B).

In the process of the XRD measurement, the sample is kept horizontal and remained immobile in the same place, while the incident X-ray and diffracted X-ray rotate toward each other synchronously, which means that only diffraction peaks from the crystal planes parallel to the sample surface can be detected. In this measuring arrangement, the diffraction peaks in the XRD pattern corresponding to the plane that parallel to the axial direction of the nanowire [0001] can be detected. So, we can conclude that planes parallel to the [0001] axis, such as $(10\bar{1}0)$, $(20\bar{2}0)$, $(11\bar{2}0)$, $(30\bar{3}0)$, will contribute most to the XRD diffraction intensity shown in Figure 1B.

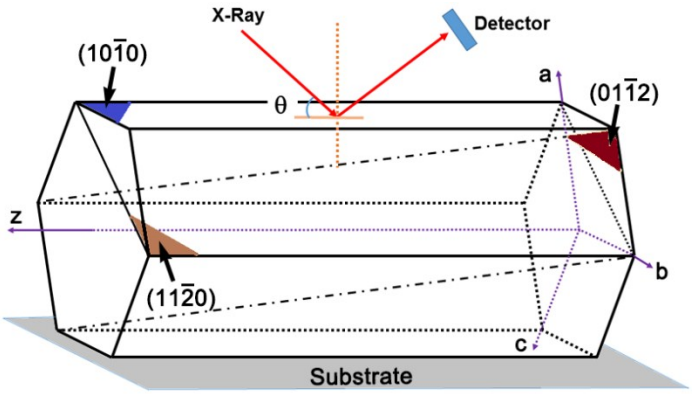

Figure 1B Schematic image of XRD analysis

In our XRD result, the intensity ratio of three highest peaks is $I_{(10\bar{1}0)} : I_{(20\bar{2}0)} : I_{(11\bar{2}0)} = 14.94 : 1.93 : 1$.

For the diffraction peaks in the standard card, it is measured from the powder sample with random orientation. So, it cannot be compared with powder diffraction results where the $(10\bar{1}1)$ peak is higher than $(10\bar{1}0)$.

Besides, we also found the peak $(01\bar{1}2)$ around 2 theta = 38.26°. However, this peak is very weak because the plane $(01\bar{1}2)$ does not parallel to the growth direction of Te NW was [0001], shown in Figure 1C.

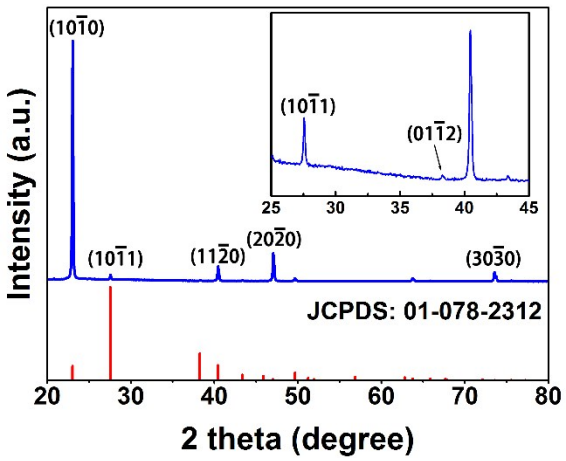

Figure 1C XRD pattern of Te NWs. The inset shows the corresponding enlarge view from 2θ between 25° and 45°.

2. X-ray photoelectron spectra (XPS) of the samples stored in ethanol for one week.

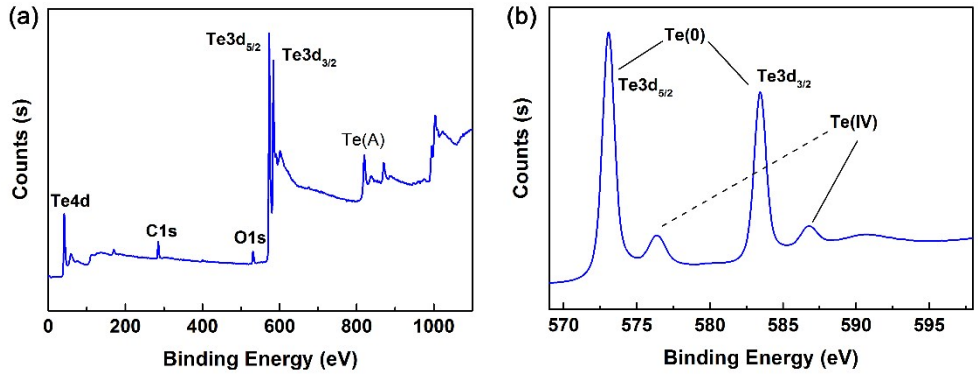

Figure 2A XPS spectra of the synthesized Te NWs measured after storing in ethanol for one week. It indicates that there is a small amount of oxidized tellurium exiting on the surface.