

Investigation of photoelectric behaviors of silver sulfide particles in different surroundings

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Supporting Information

Fig.S1 shows the XRD patterns of Ag_2S particles grown at different temperatures. The strongest peak appeared at different positions, indicating that the crystal quality depends on the growth temperature. The diffraction peak of sulfur were observed in the sample grown at low temperature (Fig.S1 a), indicating the presence of sulfur impurities.

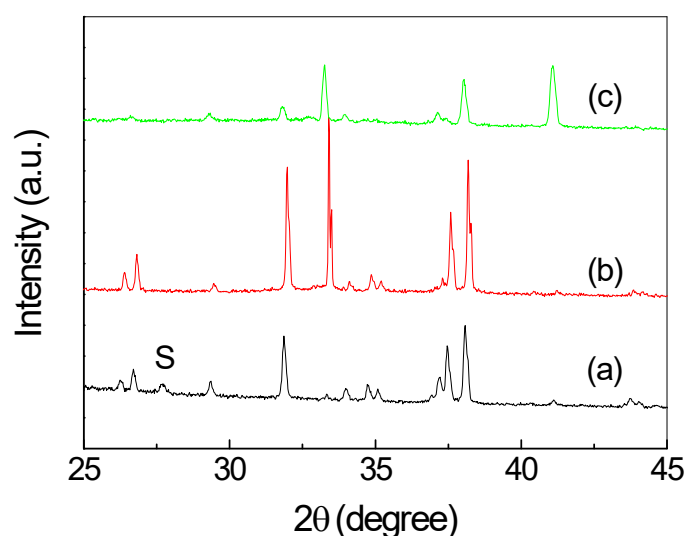


Fig. S1 X-ray diffraction patterns of Ag_2S particles prepared different temperatures: (a) 100 °C, (b) 150 °C, and (c) 200 °C, respectively. The peak at 27.7 degree is due to sulfur (PDF#08-0247). Other peaks are from silver sulfide (PDF#14-0072).

Fig. S2 shows the I-V curve of pure Ag_2S particle film, which was tested under irradiation at 500 nm. The power of the light was 2.5 mW/mm². The dark and light currents overlapped with the open circuit test current, indicating the Ag_2S film was

not conductive.

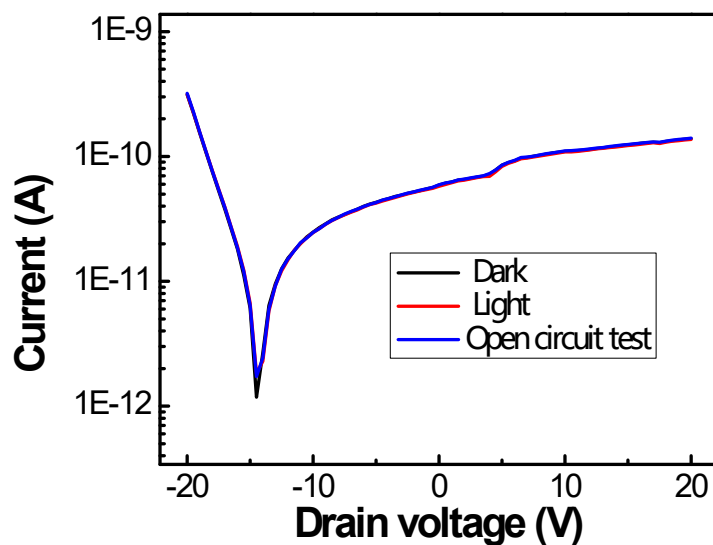


Fig. S2 The I-V curve of Ag₂S film at the 500 nm.

The conductive type of silver sulfide (Ag₂S) was tested through a hot-probe method. A voltmeter was connected with the Ag₂S film. During the test, the positive terminal was heated. If the voltmeter read positive value, the semiconductor was n-type. The result was shown in Fig. S3. We observed that the voltage was positive, indicating Ag₂S was n-type semiconductor.¹

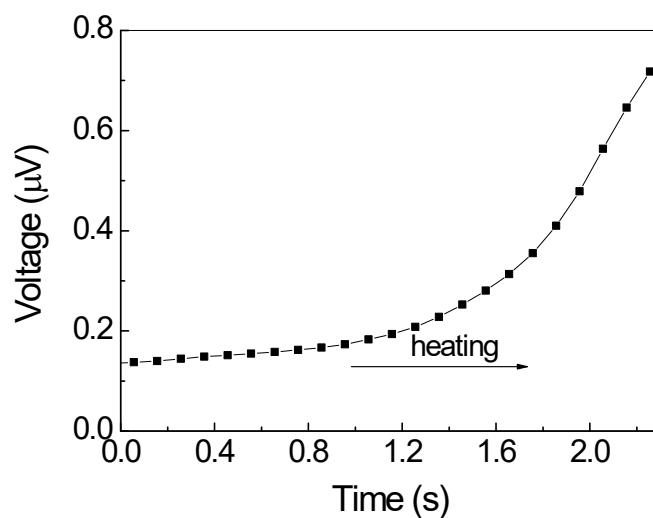


Fig. S3 Hot-probe characteristic for n-type Ag₂S.

Fig. S4 shows the resistance-time curve of pure Ag₂S photodetector with/without light exposure in inert atmosphere. We found the resistance of pure Ag₂S particle film was high and out of the range of the ohmmeter. Therefore, photocurrent effect was not observed.

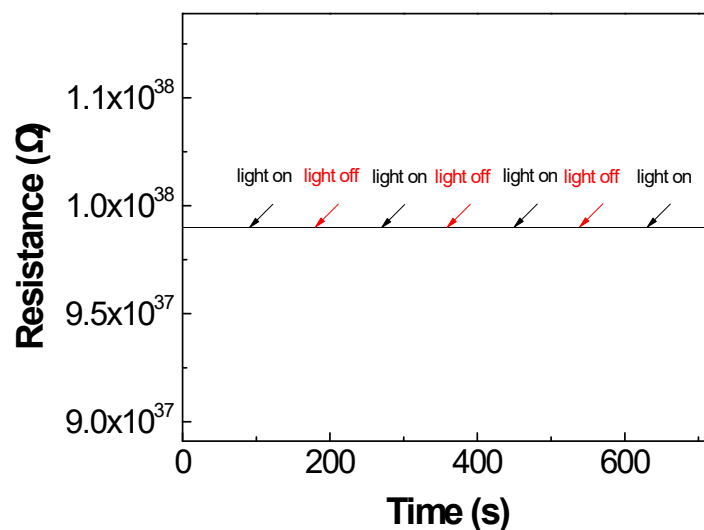


Fig. S4 The resistance-time curve of Ag₂S particles with/without light exposure in Ar.

Reference:

1. X. Peng, Y. F. Lv, L. Fu, F. Chen, W. T. Su, J. Z. Li, Q. Zhang and S. C. Zhao, *Rsc Adv*, 2021, **11**, 34095-34100.