

Supplementary Information for “Nonmonotonic wavelength dependence of polarization-sensitive infrared photoresponse of an anisotropic semimetal”

The thickness of WTe₂

The thicknesses of the WTe₂ flakes were measured by Atomic Force Microscope (**Figure S1**). The polymer has been used to protect the WTe₂ from degradation under ambient conditions during the photoresponse measurements. To measure the thickness of the sample, the polymer needs to be removed. After that, in order to measure the thickness of the sample, the polymer was removed. During the polymer removal process, some air bubbles were formed and there could be some residuals on the WTe₂ flake. These fabrication imperfections cannot affect the photoresponse of the device, since the optoelectronic characterization was performed in advance.

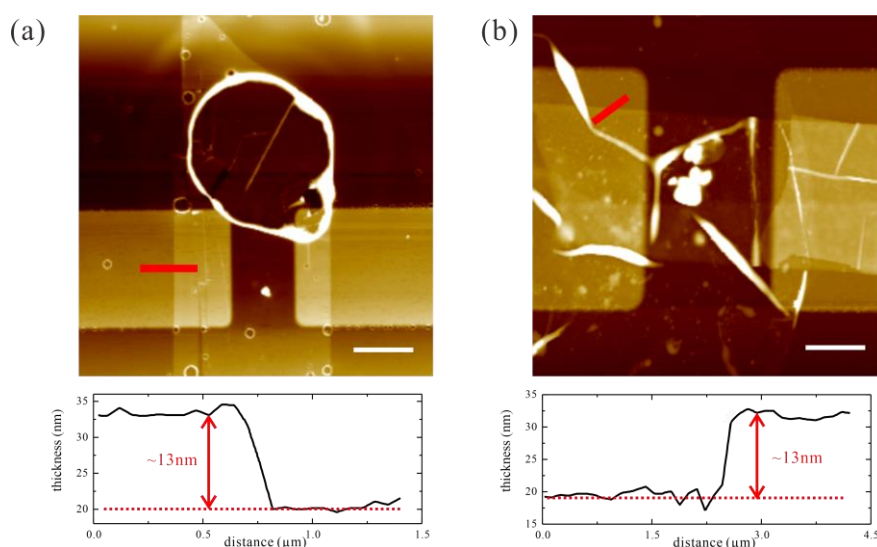


Figure S1. AFM image of two devices in the main text. The thicknesses of the WTe₂ flakes are about 13 nm. The scale bars in (a) and (b) are 10 μm and 5 μm respectively.

The simulated absorption spectrum

The SiO₂/Si substrate is considered in the simulation. The thickness of the WTe₂ is assumed to be 10 nm typically. The incident light is polarized within the plane of the *a*-axis and the *b*-axis. So the optical conductivity adopted in the simulation takes an average over the optical conductivity along the *a*-axis and that along the *b*-axis.

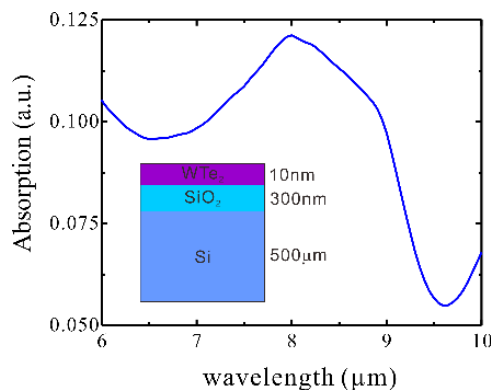


Figure S2. The simulated absorption spectrum of a 10 nm thick WTe₂ on a SiO₂/Si substrate.

Wavelength dependence photocurrent of randomly aligned sample

As shown in Fig. S3, the sample is randomly aligned on the two electrodes. The inset shows the microscopic image of the sample. The angle between the a -axis of WTe_2 and the connection of the two electrodes is about 75° . The photocurrent spectrum is similar to that in the main text, regardless of the relatively weak responsivity. Since the mechanical exfoliated WTe_2 flake varies from sample to sample, it is normal that the absolute responsivities of the devices are also different.

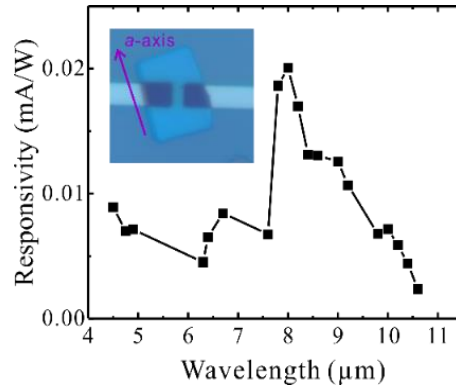


Figure S3. The photocurrent spectrum of a randomly aligned WTe_2 flake. Inset: the microscopic image of the randomly aligned sample