Supplementary Information for

Anisotropic van der Waals Tellurene-Based Multifunctional, Polarization-Sensitive, In-Line Optical Device

Jing Yu[†, ‡, ǁ], Haoran Mu[†, ǁ, *], Pu Wang[†, ǁ], Haozhe Li[†], Zixin Yang[§], Jing Ren[†], Yang Li[†], Luyao Mei[†], Jingni Zhang[†], Wenzhi Yu[†], Nan Cui[†], Jian Yuan[⊥], Jian Wu[§], Sheng Lan[‡, *], Guangyu Zhang[†], and Shenghuang Lin[†, *]

[†]Songshan Lake Materials Laboratory, Dongguan 523808, China.

[‡]Guangdong Provincial Key Laboratory of Nanophotonic Functional Materials and Devices, School of Information and Optoelectronic Science and Engineering, South China Normal University, 510006 Guangzhou, China.

[§]College of Advanced Interdisciplinary Studies, National University of Defense Technology, Changsha 410073, China.

[⊥]State Key Laboratory of Applied Optics, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun 130033, China.

*To whom correspondence should be addressed:
muhaoran@sslab.org.cn (H. Mu), slan@scnu.edu.cn (S. Lan), or linshenghuang@sslab.org.cn (S. Lin)

[ǁ]These authors contributed equally to this work.

Keywords: tellurene, polarization-sensitive, mode-locking, photodetector, 2D

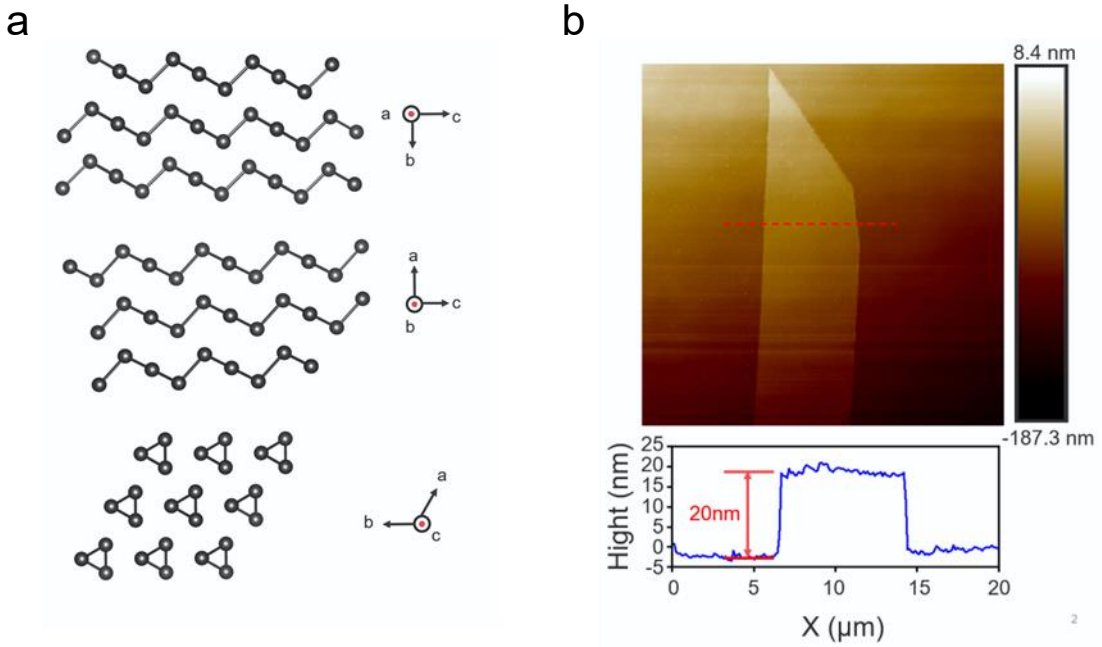

Figure S1. (a) Schematic of the atomic structure of Te. (b) AFM topography image of a Te nanosheet (top panel) and cross-sectional height profile (bottom panel) along the red dashed line in the topography image.

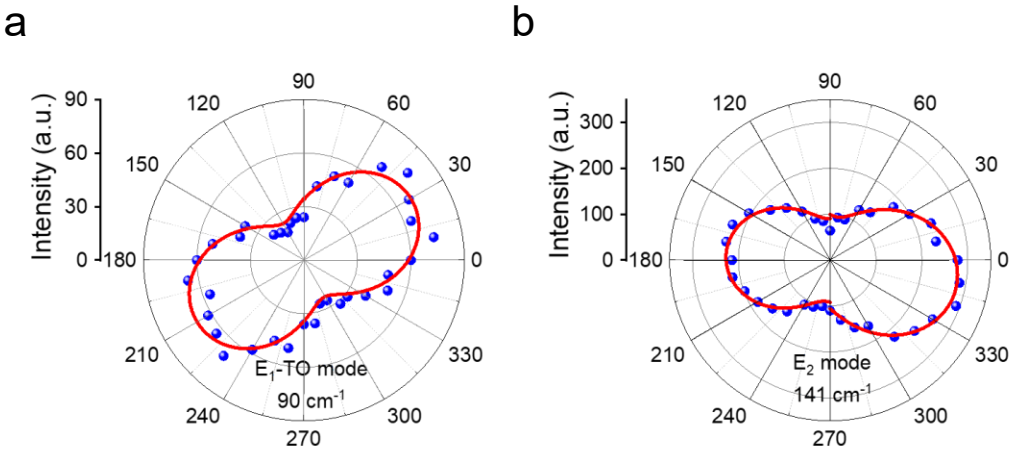

Figure S2. Polar figures of Raman intensity corresponding to E_1-TO mode located at (a) 90 cm^{-1} and E_2 mode located at (b) 141 cm^{-1}.

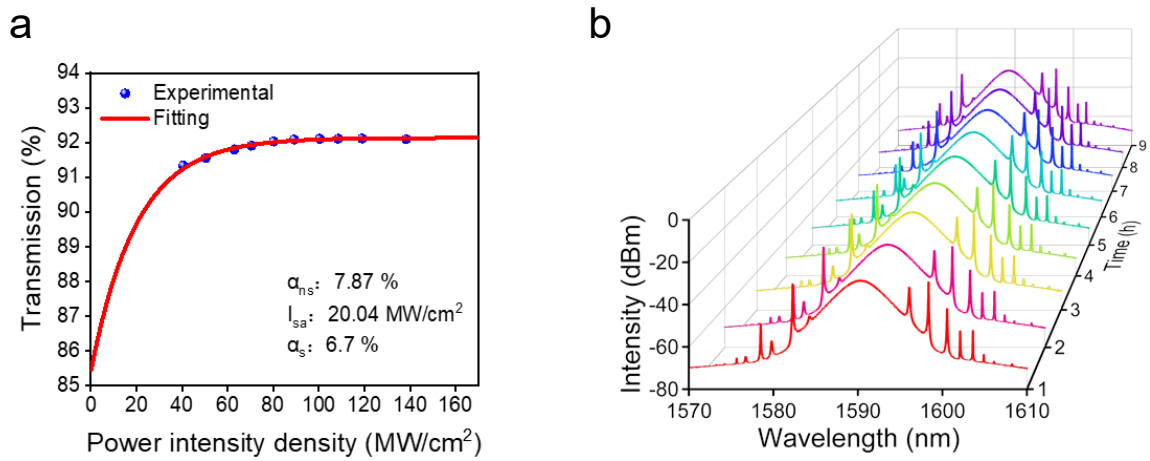

Figure S3. (a) Transmittance versus optical intensity. (b) Measured time-dependent spectra of output pulse for over 9 h.

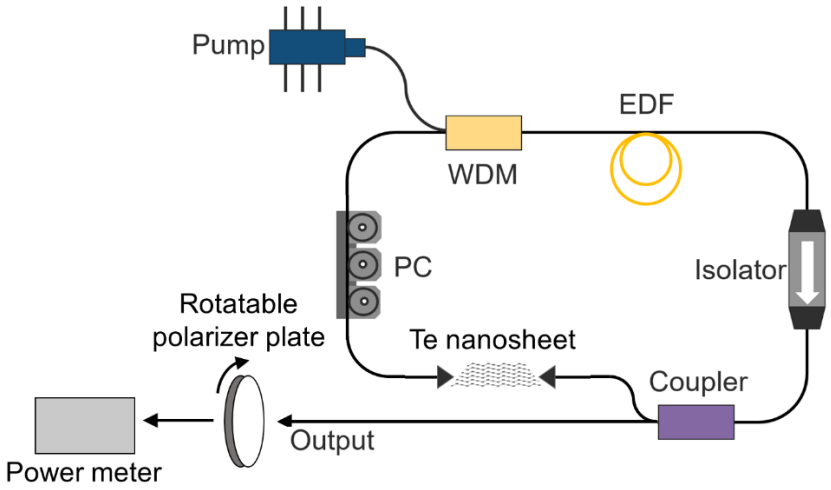

Figure S4. Experimental setup for characterizing the polarization state of the as-fabricated mode-locked fiber lasers.

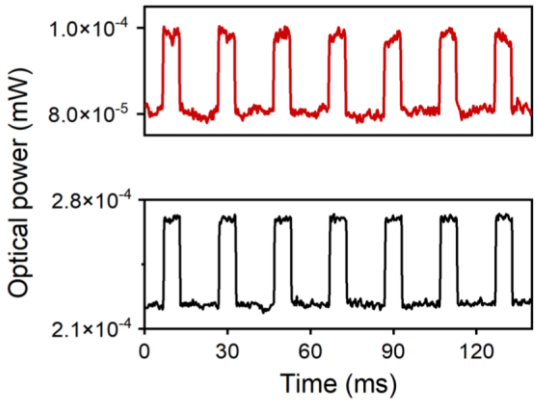

Figure S5. Effect of thickness of Te nanosheet on the output of the Te optical switch.

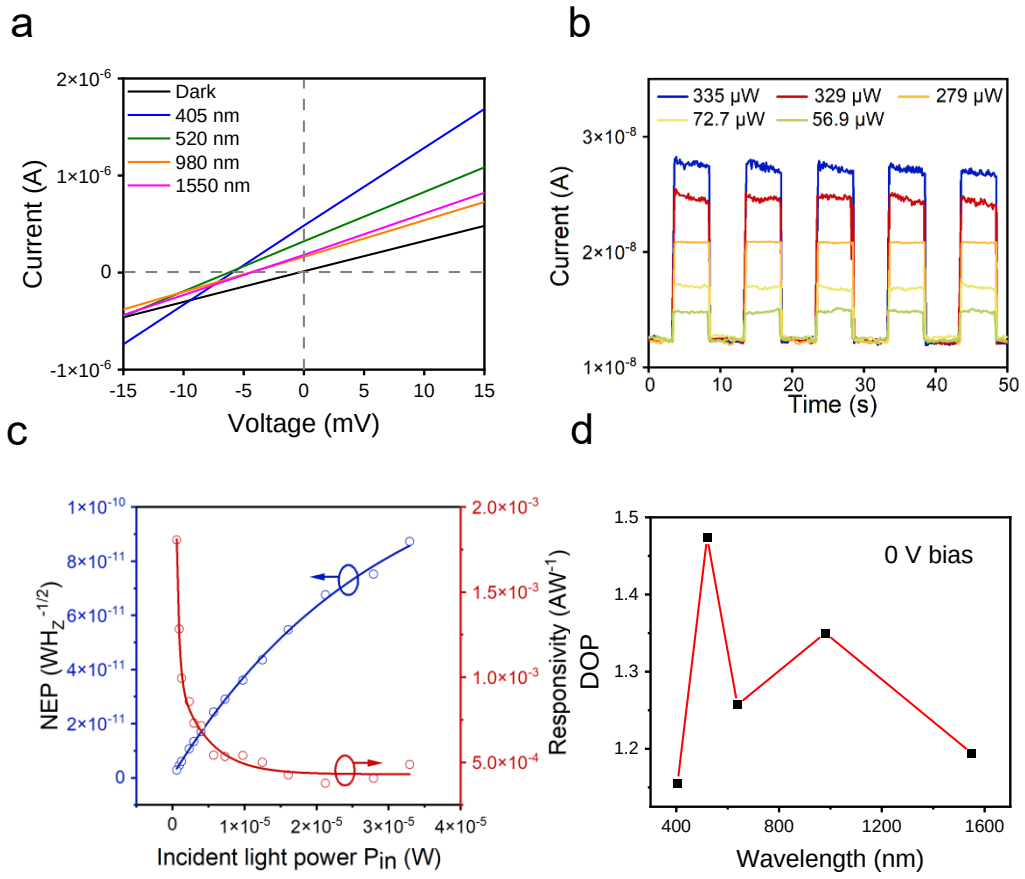

Figure S6. (a) Linear current-voltage curves of tellurene nanosheets-based photodetector in dark condition and under laser irradiation with different wavelengths. (b) Time-resolved current as a function of the incident laser power under periodically switched irradiation of 0.2 Hz at 0V bise. (c) NEP and Responsivity of Te nanosheet detector versus the incident laser power. (d) The DOP of the photodetector at a laser with 0 V bias and different incident wavelengths.

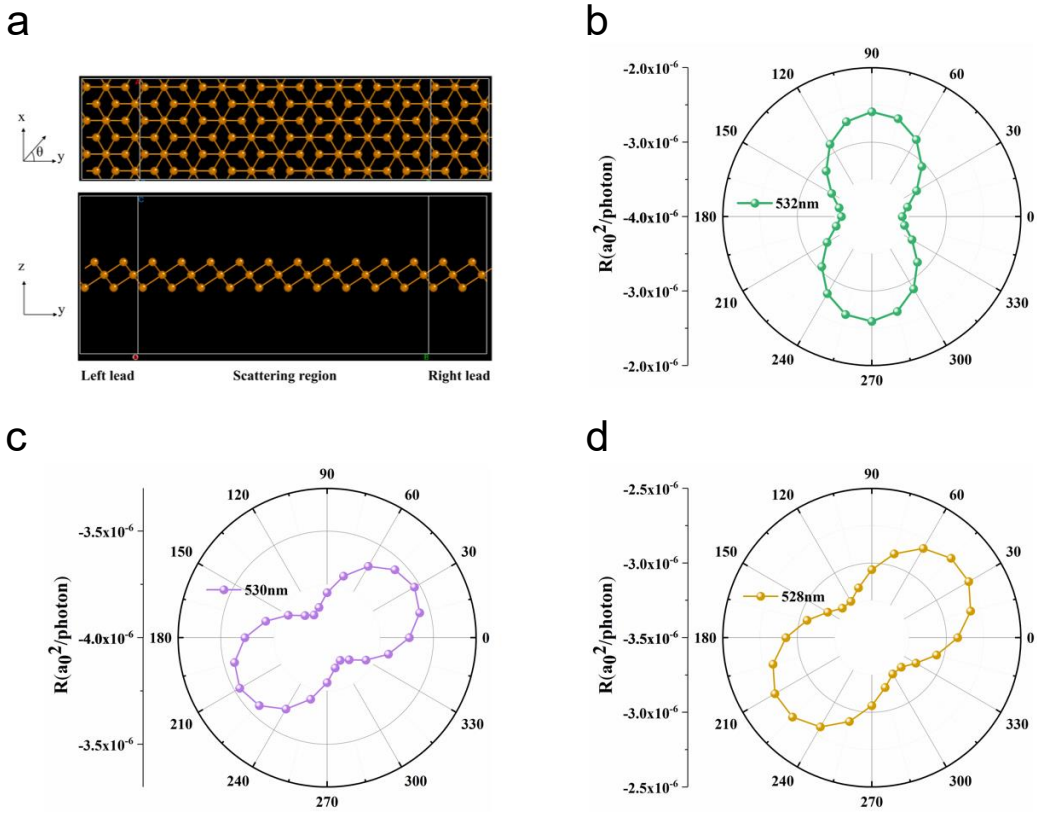

Figure S7. (a) The tellurene-based two-probe device model consists of three parts: left and right electrodes and central scattering region. (b) Polar plots of photocurrent dependence for polarization at 532 nm, (c) 530 nm, and (d) 528 nm under zero-bias and linearly polarized light, respectively.