Supplementary information

Two-dimensional tellurium−polymer membrane for ultrafast photonics

Jia Guo,†[a] Jinlai Zhao,†[a,b,c] Dazhou Huang,[a] Yunzheng Wang,[a] Feng Zhang,[a] Yanqi Ge,[a] Yufeng Song,[a] Chenyang Xing,*[a,d] Dianyuan Fan[a] and Han Zhang*[a]

[a]*Shenzhen Engineering Laboratory of phosphorene and Optoelectronics, International Collaborative Laboratory of 2D Materials for Optoelectronics Science and Technology of Ministry of Education, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, China*

E-mail: xingchenyang@szu.edu.cn, hzhang@szu.edu.cn

[b]*Faculty of Information Technology Macau University of Science and Technology, Avenida Wai Long, Taipa, Macau 999078, P. R. China*

[c]*College of Materials Science and Engineering, Shenzhen Key Laboratory of Polymer Science and Technology, Guangdong Research Center for Interfacial Engineering of Functional Materials, Shenzhen 518060, P.R. China*

[d]*Center for Stretchable Electronics and Nanoscale Systems, Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, P. R. China*

†These authors contributed equally to this work.

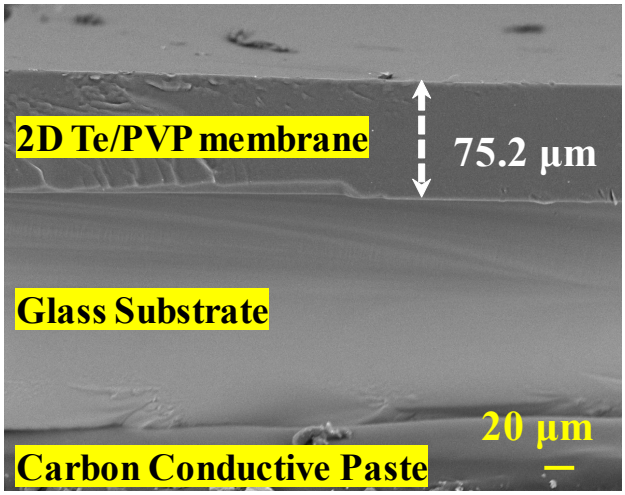

Figure S1. Cross-sectional SEM image of a 2D Te/PVP membrane.

Table S1 Absorption and effective length of Te/PVP films at 800, 1060 and 1550 nm, respectively.

λ (nm)	A	L_{eff} (μm)
800	0.457	46.5
1060	0.345	51.9
1550	0.141	64.2

The linear absorption coefficient (α_0) of the Te/PVP films at different wavelengths can be expressed by following equation

$$\alpha_0 = (\ln 10^A)/L$$

where A is absorption of Te/PVP films at different wavelengths and L is the height of Te/PVP films. The effective length of Te/PVP films at different wavelengths is given by

$$L_{eff} = (1 - e^{-\alpha_0 L})/\alpha_0$$

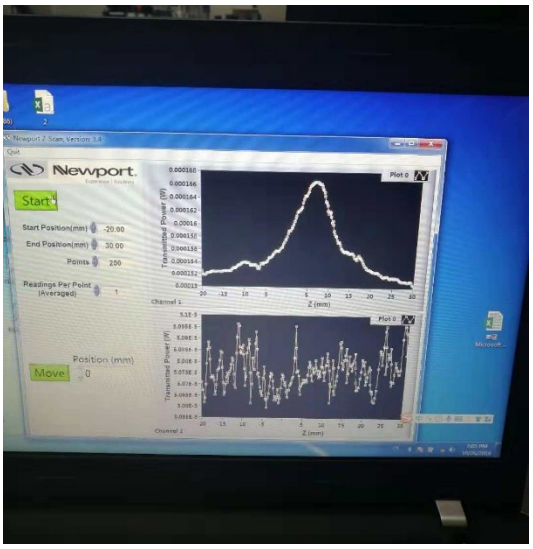

Figure S2. An illustrative photograph of the open-aperture Z-scan results using 2D Te/PVP membrane at 800 nm. The up plot is the nonlinearly transmitted power, the below one shows the laser fluctuations.

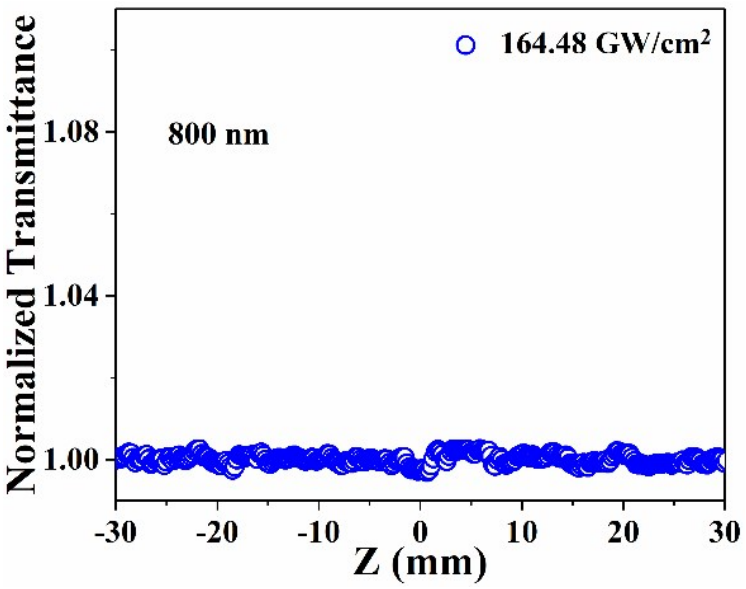

Figure S3. The nonlinear optical response of PVP by open-aperture Z-scan experiment at 800 nm.

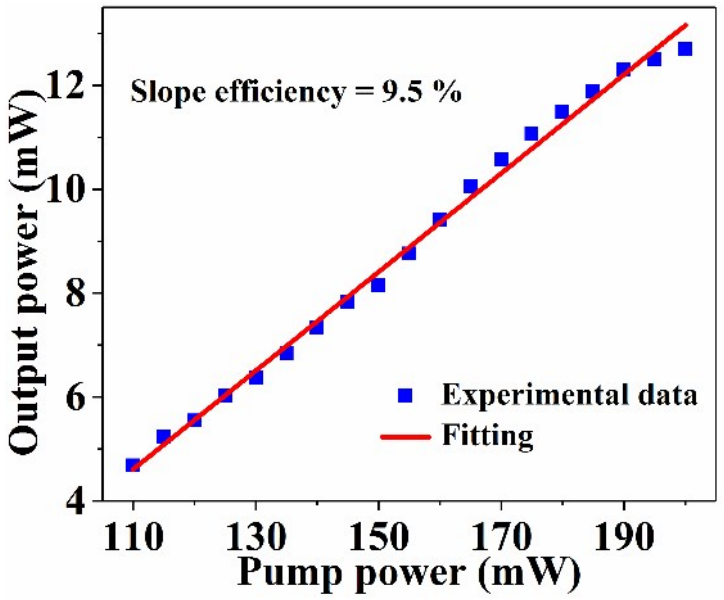

Figure S4. Output power as a function of pump power at 1060 nm. (Slope efficiency = 9.5 %).