Electronic Supplementary Material (ESI) for Nanoscale.

Supporting information

The Nonlinear Optical Transition Bleaching in Tellurene

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Note S1. OA Z-scan results of tellurene with different wavelength

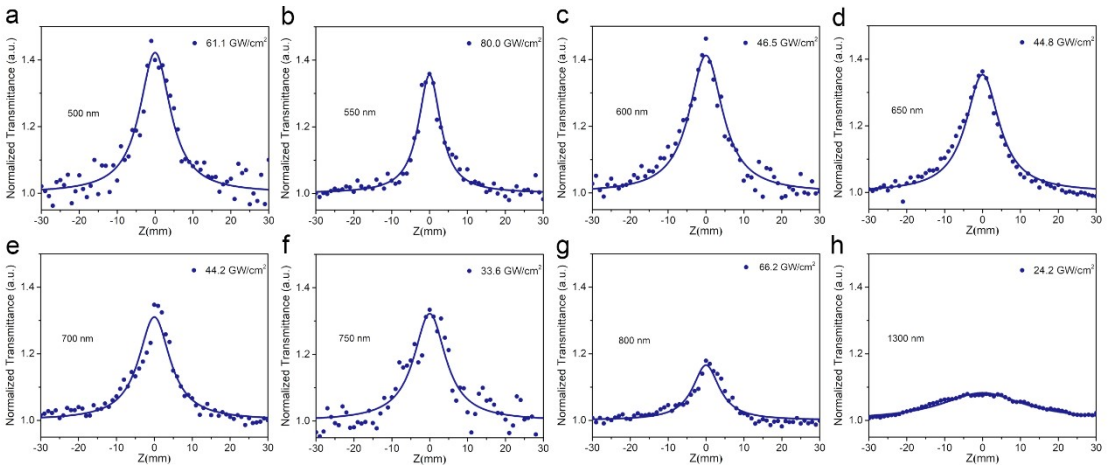

Figure S1. OA Z-scan results of tellurene with the wavelength of **(a)** 500nm, **(b)** 550nm, **(c)** 600nm, **(d)** 650nm, **(e)** 700nm, **(f)** 750nm, **(g)** 800nm and **(h)** 1300nm.

Note S2. Calculation of carrier intensity

To calculate the carrier intensity excited by pump beam, the laser pulse energy E, linear absorption coefficient α , photon energy $\mathrm{h}\nu$ and excitation volume V should be included:

$$\mathrm{n} = \frac{E\alpha}{h\nu V}$$

where $\mathrm{V} = \frac{\pi D^2}{4} L$ is the volume of cylinder, $L = 0.1cm$ is the thickness of sample, D is the spot diameter of focused pump beam which is calculated with the focusing formula of Gaussian beam:

$$\mathrm{D} = \frac{4\lambda f}{\pi d}$$

where $\mathrm{f} = 25cm$ is the focal length of lens, $\mathrm{d} = 2\mathrm{mm}$ is spot diameter in front of lens. Combined with the above derivation, the carrier intensity can be calculated.

Note S3. Density of states of tellurene

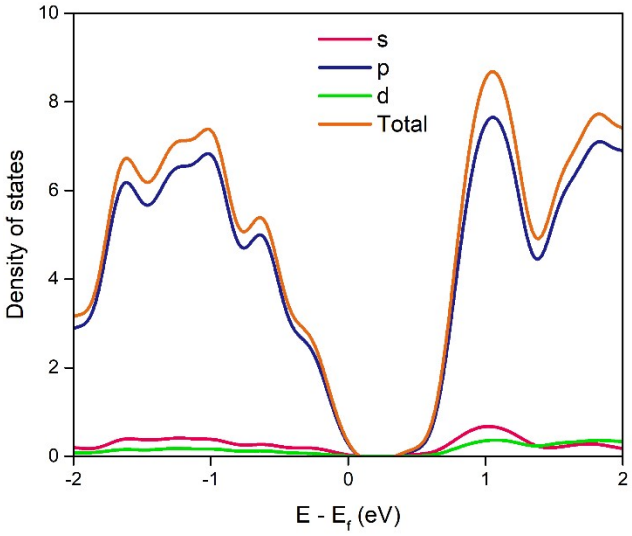

Figure S2. Sum and partial density of states of tellurene.