

Supporting Information

Size-dependent nonlinear optical properties of black phosphorus nanosheets and its applications in ultrafast photonics

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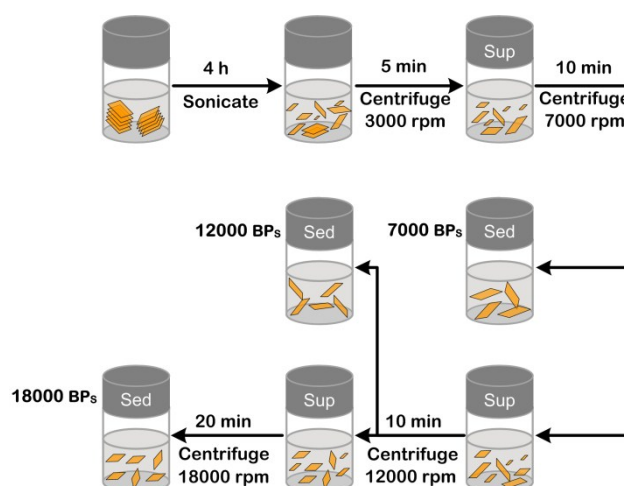


Figure S1. Schematic illustration of the fabrication process of BPs. Sup: Supernatant. Sed: Sediment.

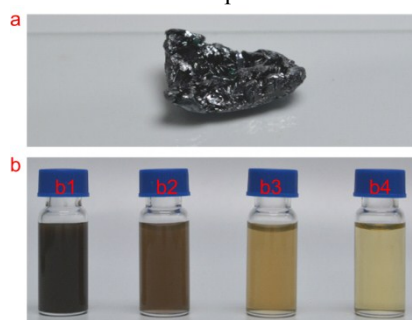


Figure S2. Photograph of BP samples. (a) BP crystal. (b) Solution of (b1) BPs before centrifugation, (b2) 7000 BPs, (b3) 12000 BPs and (b4) 18000 BPs.

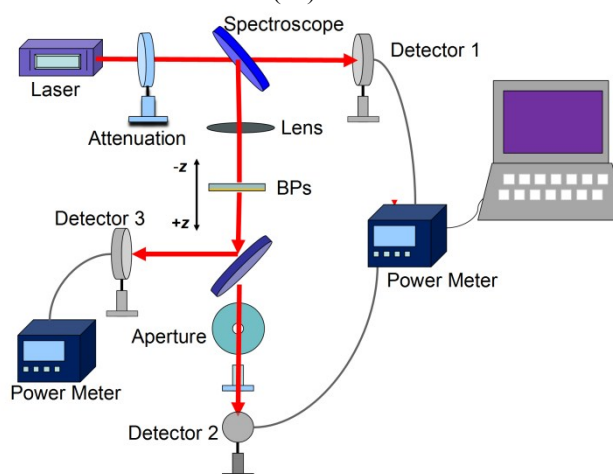


Figure S3. The experimental setup of open and close aperture Z-scan technique at 800 nm.

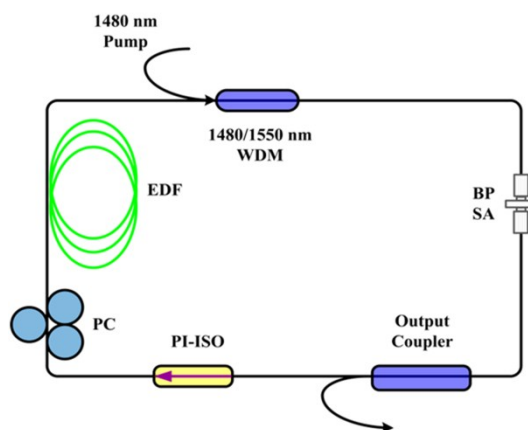


Figure S4. Experimental setup of the BP-SA based Erbium-doped fiber laser.

The fiber laser with black phosphorus saturable absorber (BP-SA) is shown in **Figure S4**. A Raman fiber laser operated at 1480 nm is used as the pump source. The fiber cavity consists of a 1480/1550 wavelength division multiplexer (WDM), a polarization independent isolator (PI-ISO), a polarization controller (PC), a 10:90 optical coupler (OC), erbium-doped fiber (EDF), and single mode fiber (SMF). The total cavity length is 16 m, where the length of the SMF (Corning SMF-28e) is 14.8 m and the length of the EDF (OFS, EDF80) is 1.2 m. The cavity with the normal dispersion EDF is dispersion managed while the net cavity dispersion is anomalous. The pump from a 1480 nm Raman fiber laser source coupled into the cavity through a WDM, and the PI-ISO is used to ensure unidirectional light propagator. A 10% OC is employed to output the laser emission, and PC is used to obtain the mode-locking state. The laser output is monitored by an optical spectrum analyzer (YOKOGAWA AQ6370C), and a 1GHz oscilloscope (Agilent DS09104A) with a 1.2 GHz photodiode detector (Thorlabs DET01CFC). The pulse width is measured by an optical autocorrelation (Femtochrome FR-103HS) and the pulse repetition rate is measured by a spectrum analyzer (Agilent, N9030A).