

## Two-dimensional BiTeX Crystal with Persistent Luminescence Induced by Photochemical Reaction

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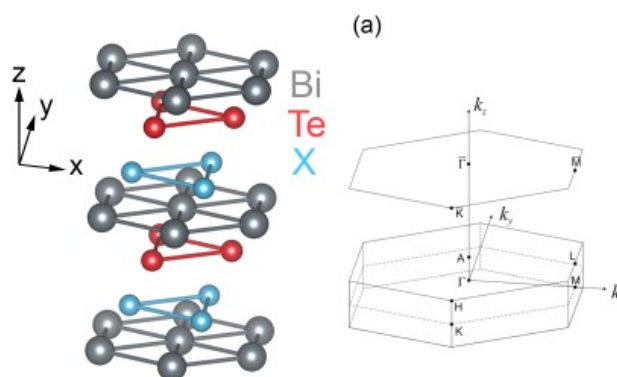
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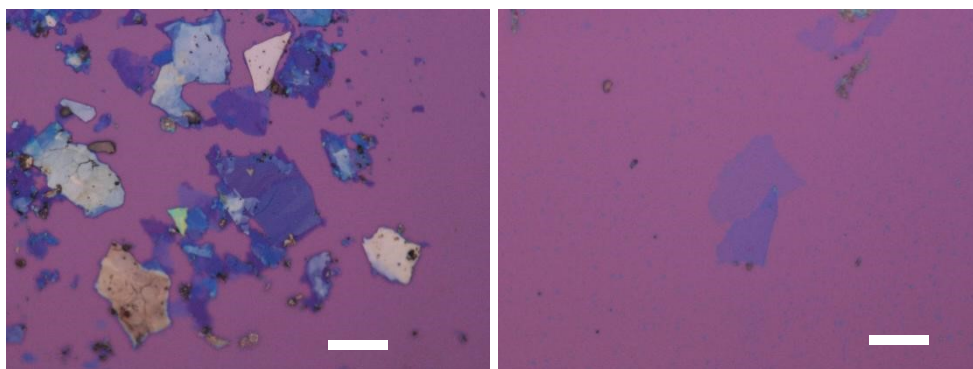
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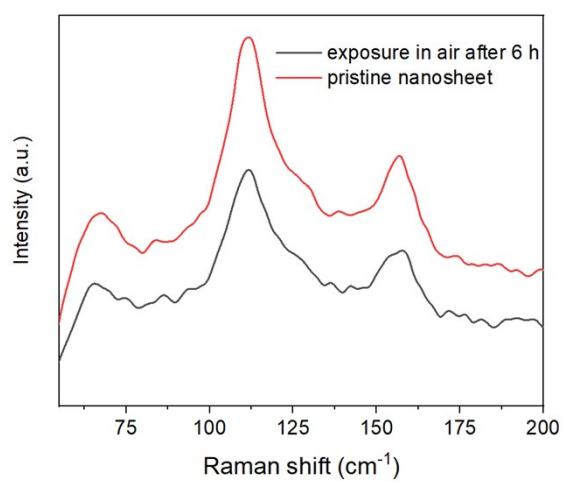
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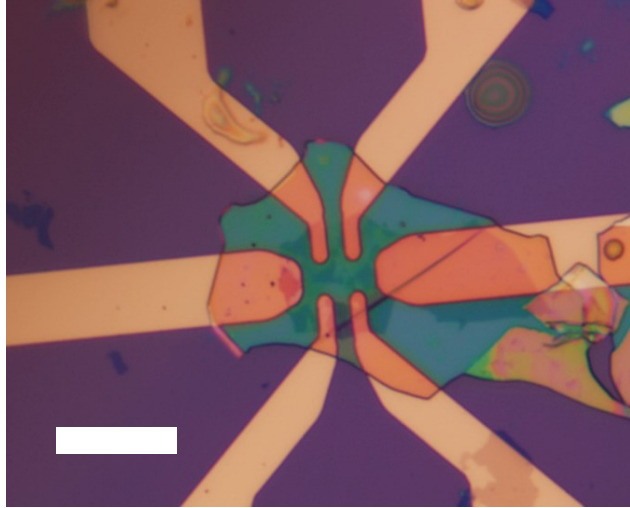
**Figure S1.** BiTeX (X = Cl, Br, I) is a layered van der Waals material in which Te layers, Bi layers, and X layers are alternately stacked along the c-axis direction.



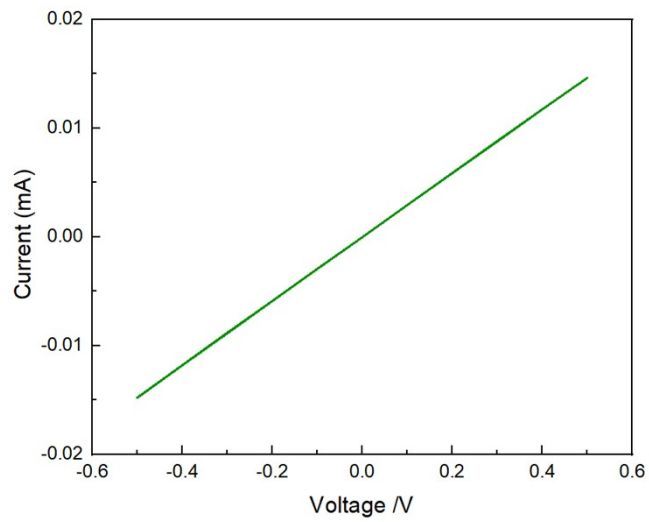
**Figure S2.** BiTeI (left) and BiTeCl (right) nanosheets on SiO<sub>2</sub>/Si substrate under optical microscope, with inset scale bar 20  $\mu\text{m}$  and 10  $\mu\text{m}$ , respectively.



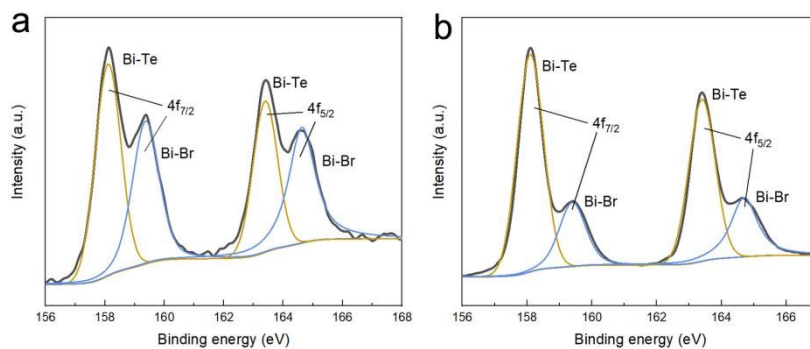
**Figure S3.** The stability of BiTeBr nanosheet characterized by Raman spectra.



**Figure S4.** The nanodevice images of BiTeBr nanosheets with BN capped. The inset scale bar is 20  $\mu\text{m}$ .



**Figure S5.** I-V curves of BiTeBr nanosheets nanodevice test with two electrodes.



**Figure S6.** The XPS analysis of Bi 4f peak for BiTeBr nanosheet (a) before and (b) after UV light irradiation.

**Table 1.** Atomic ratios for BiTeBr nanosheet under EDS mapping of TEM.

Element	wt%	atomic ratio
O	4.51	30.12
Br	14.18	18.97
Te	28.62	23.97
Bi	52.69	26.94
total	100.00	100.00