

## Supporting Information

# Ultrabroad Near-Infrared Photoluminescence from Bismuth Doped CsPbI<sub>3</sub>: Polaronic Defects vs. Bismuth Active Centers

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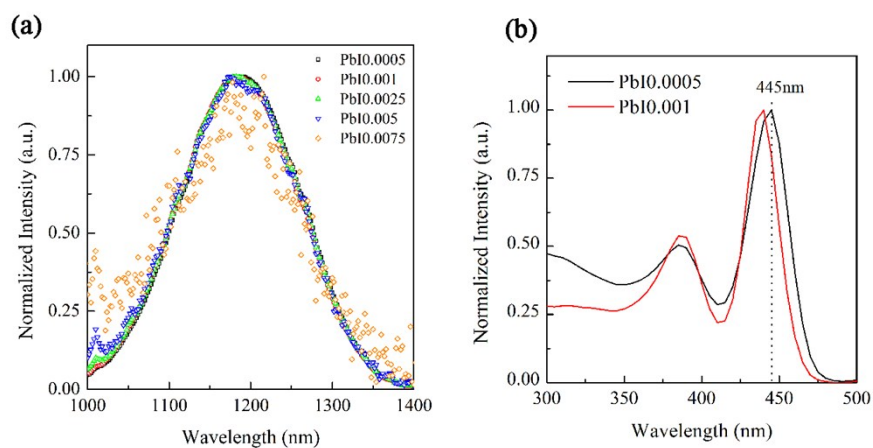
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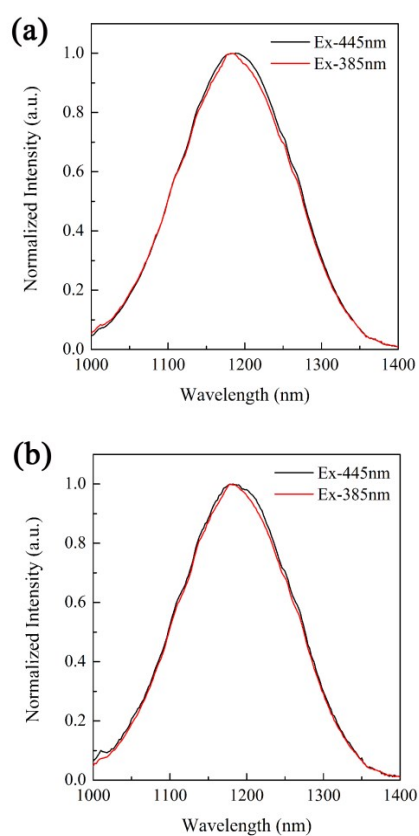
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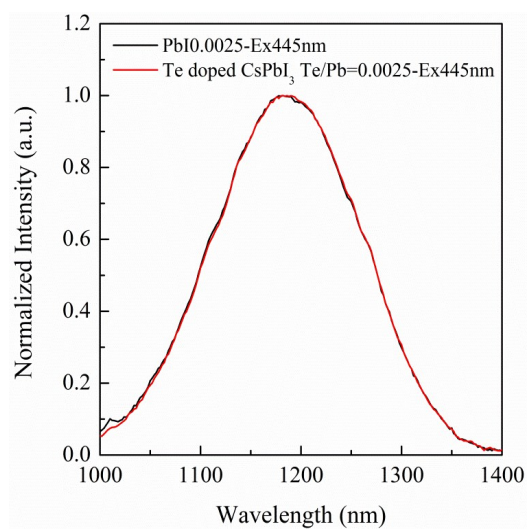
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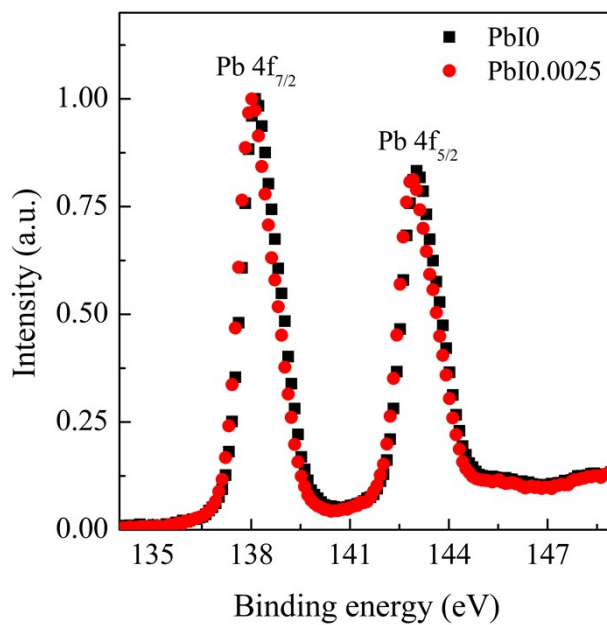
**Figure S1.** (a) Normalized PL spectra of Bi doped CsPbI<sub>3</sub>. (b) PLE spectra of the PbI<sub>0.0005</sub> and PbI<sub>0.001</sub> samples.



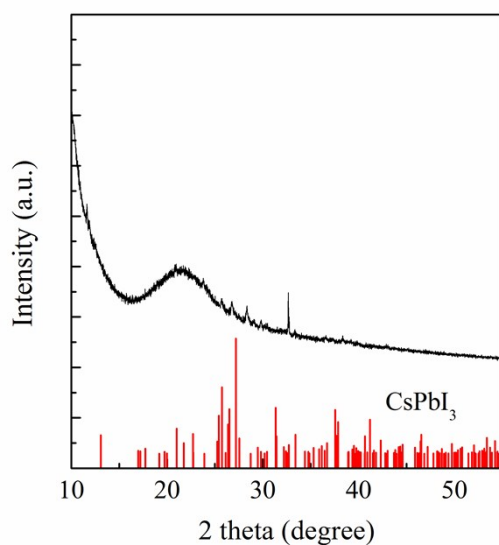
**Figure S2.** Normalized PL spectra of the PbI<sub>0.0005</sub> (a) and PbI<sub>0.0025</sub> (b) samples under the excitation of 385 and 445 nm.



**Figure S3.** Normalized PL spectra of Bi and Te doped samples under the excitation of 445 nm.



**Figure S4.** Normalized XPS spectra of the pristine and PbI0.0025 samples, and the peaks in the range of 134~149 eV are assigned to Pb ( $4f_{7/2}$ ,  $4f_{5/2}$ ).



**Figure S5.** XRD pattern of Bi doped CsPbI<sub>3</sub> nanowires attached on the silica substrate.

Note that the sample was sealed in a transparent hermetic dome (A100B33 Bruker AXS), thus resulting in rather low signal/noise ratio.

**Table S1.** The fitted lifetimes of Bi doped CsPbI<sub>3</sub> by a mono- or multi-exponential function.

Sample	A <sub>1</sub>	t <sub>1</sub> (μs)	A <sub>2</sub>	t <sub>2</sub> (μs)	A <sub>3</sub>	t <sub>3</sub> (μs)
PbI0.0005		20.19513				
PbI0.001		21.73614				
PbI0.0025	0.3688	20.79324	0.55646	14.36672	0.22469	2.45833
PbI0.005	0.57223	16.84443	0.37567	5.96951	0.41678	1.40545
PbI0.0075	0.41645	15.65968	0.56316	5.38636	1.23278	0.65076
Te doped CsPbI <sub>3</sub> (Te/Pb0.0025)	0.07127	37.39487	0.93314	17.92716	0.71832	0.52264