Supporting Information

Ultrabroad Near-Infrared Photoluminescence from Bismuth Doped CsPbI₃: Polaronic Defects vs. Bismuth Active Centers

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Figure S1. (a) Normalized PL spectra of Bi doped CsPbI$_3$. (b) PLE spectra of the PbI0.0005 and PbI0.001 samples.

Figure S2. Normalized PL spectra of the PbI0.0005 (a) and PbI0.0025 (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 (4f7/2, 4f5/2).
**Figure S5.** XRD pattern of Bi doped CsPbI$_3$ 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$_3$ by a mono- or multi-exponential function.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$A_1$</th>
<th>$t_1$ ($\mu$s)</th>
<th>$A_2$</th>
<th>$t_2$ ($\mu$s)</th>
<th>$A_3$</th>
<th>$t_3$ ($\mu$s)</th>
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</thead>
<tbody>
<tr>
<td>PbI0.0005</td>
<td></td>
<td>20.19513</td>
<td></td>
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<tr>
<td>PbI0.001</td>
<td></td>
<td>21.73614</td>
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<tr>
<td>PbI0.0025</td>
<td>0.3688</td>
<td>20.79324</td>
<td>0.55646</td>
<td>14.36672</td>
<td>0.22469</td>
<td>2.45833</td>
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<tr>
<td>PbI0.005</td>
<td>0.57223</td>
<td>16.84443</td>
<td>0.37567</td>
<td>5.96951</td>
<td>0.41678</td>
<td>1.40545</td>
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<td>PbI0.0075</td>
<td>0.41645</td>
<td>15.65968</td>
<td>0.56316</td>
<td>5.38636</td>
<td>1.23278</td>
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<td>Te doped CsPbI$_3$ (Te/Pb 0.0025)</td>
<td>0.07127</td>
<td>37.39487</td>
<td>0.93314</td>
<td>17.92716</td>
<td>0.71832</td>
<td>0.52264</td>
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