Supporting Information

A micro-laser grown from non-photoluminescence Cs_4PbBr_6 nanocrystals

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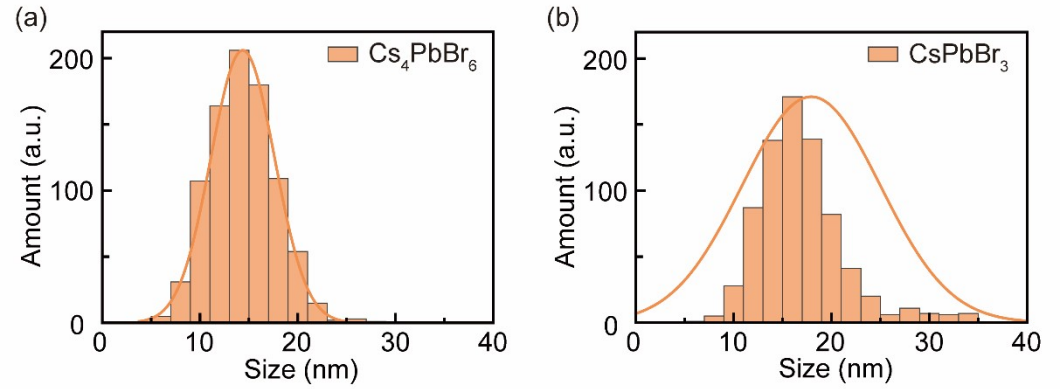

Figure S1. The size statistics of nanocrystals. a) The size distribution of synthesized Cs_4PbBr_6 NCs, with the majority of nanocrystals ranging from 10 to 18 nm, and an average size of 14.3 nm. b) The size statistics of transformed $CsPbBr_3$ NCs, showing a broader size distribution, with an average size of 18 nm.

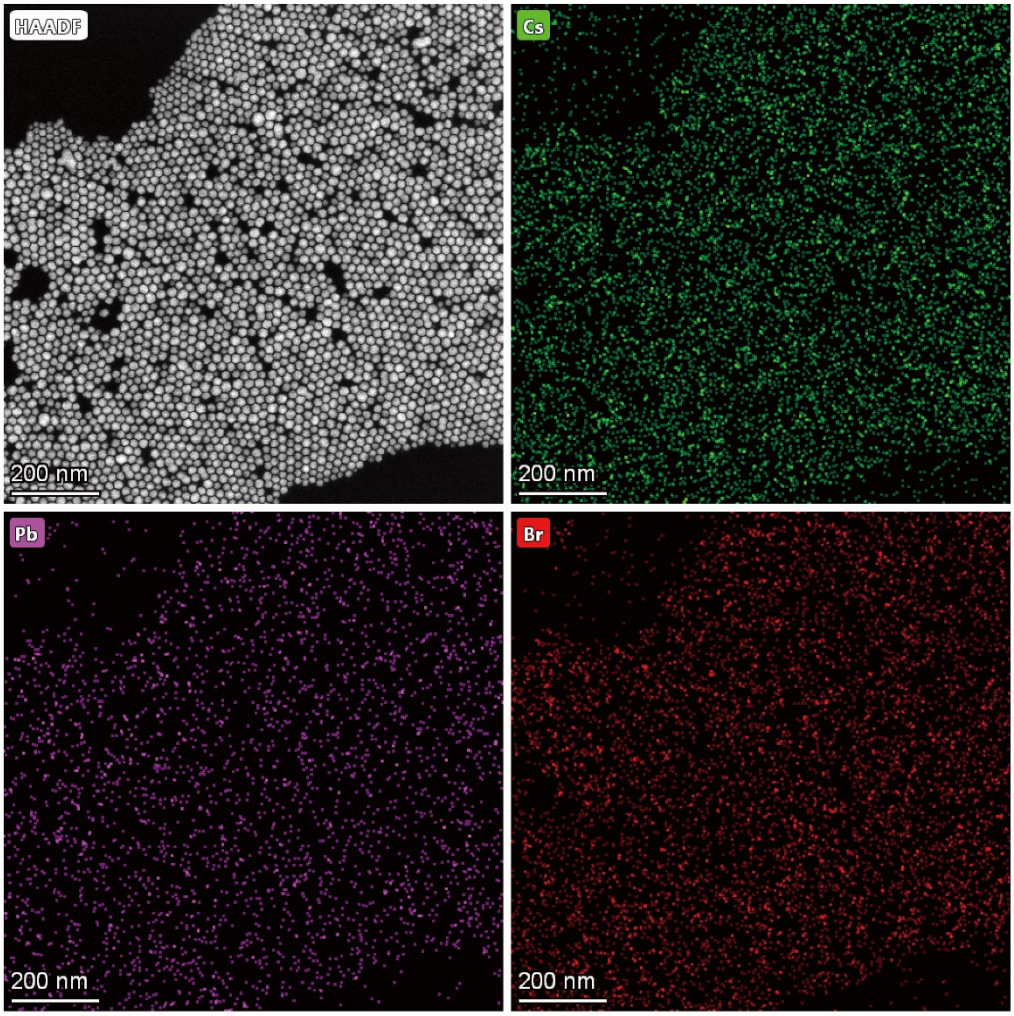

Figure S2. The TEM image and corresponding elemental mapping of synthesized Cs_4PbBr_6 NCs show a clear and uniform distribution of Cs, Pb, and Br elements throughout the nanocrystals.

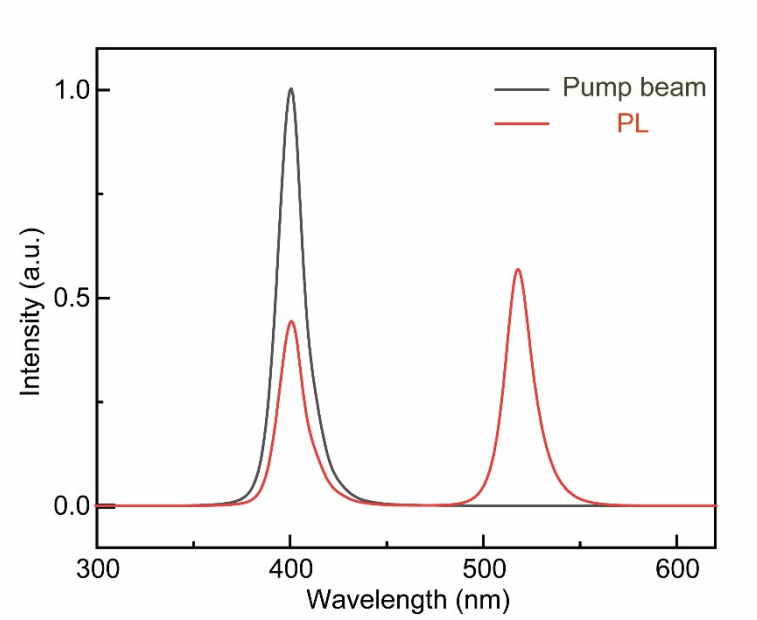

Figure S3. The PLQY of the transformed $CsPbBr_3$ NCs reaches up to 79%.

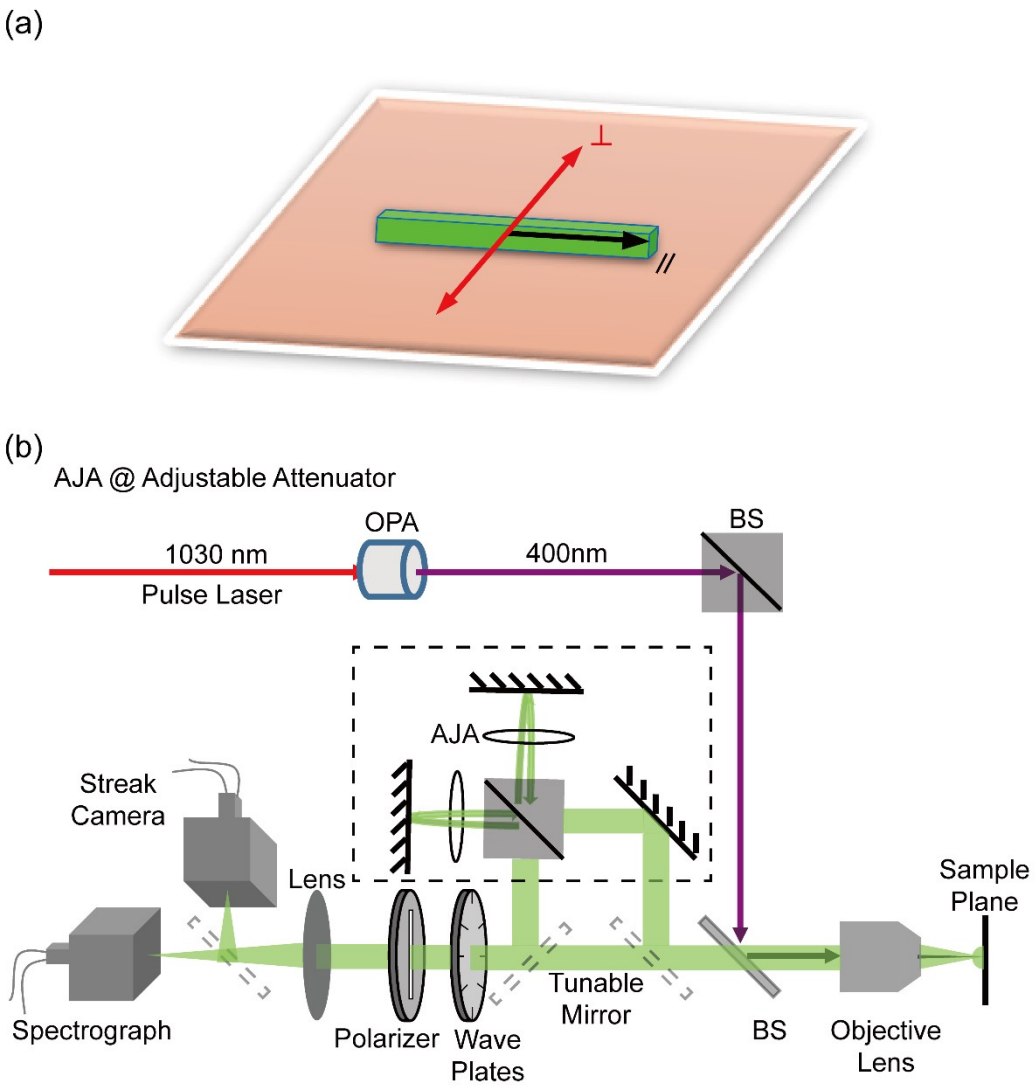

Figure S4. Experimental setup diagram. a) Schematic diagram of sample placement for polarization detection, with the PL signals collected through the nanowire's long axis direction (parallel) and cross-sectional direction (perpendicular). b) The custom-built confocal PL microscopy system, where the pump lasing source is tuned from 1030 nm to 400 nm by using an OPA.

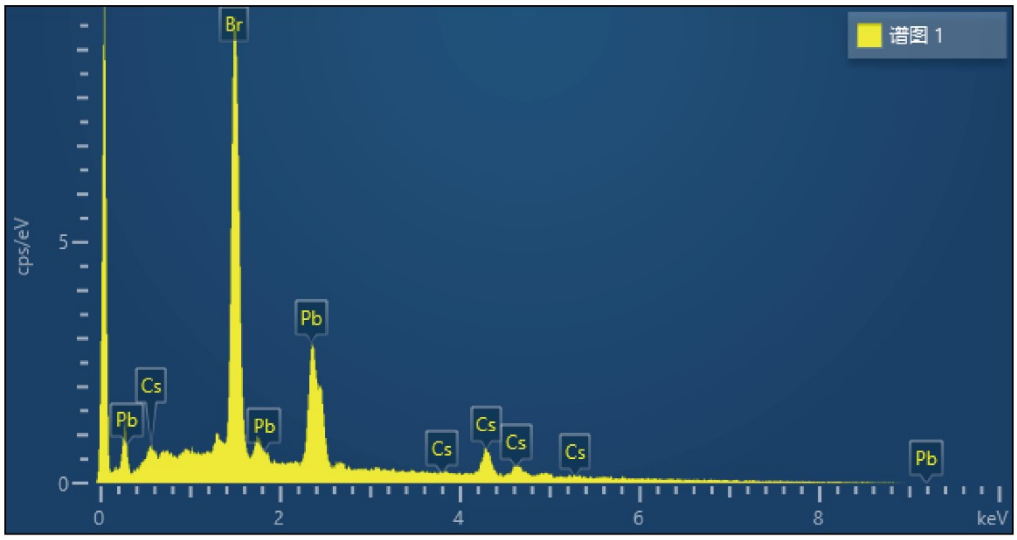

Figure S5. Elemental analysis of grown nanowires reveals the presence of only Cs, Pb, and Br elements, with a ratio close to 1:1:3.

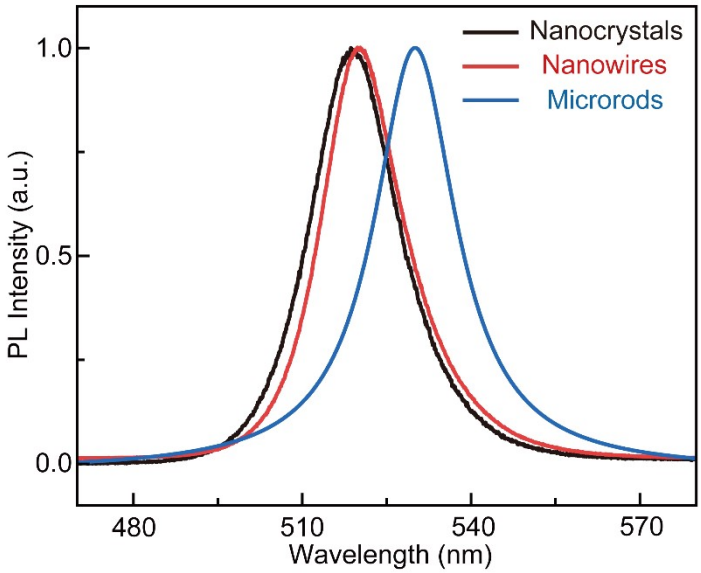

Figure S6. Normalized PL spectra of different $CsPbBr_3$ samples, including nanocrystals, nanowires, and microrods, demonstrate a redshift in the PL center wavelength as the sample size increases.

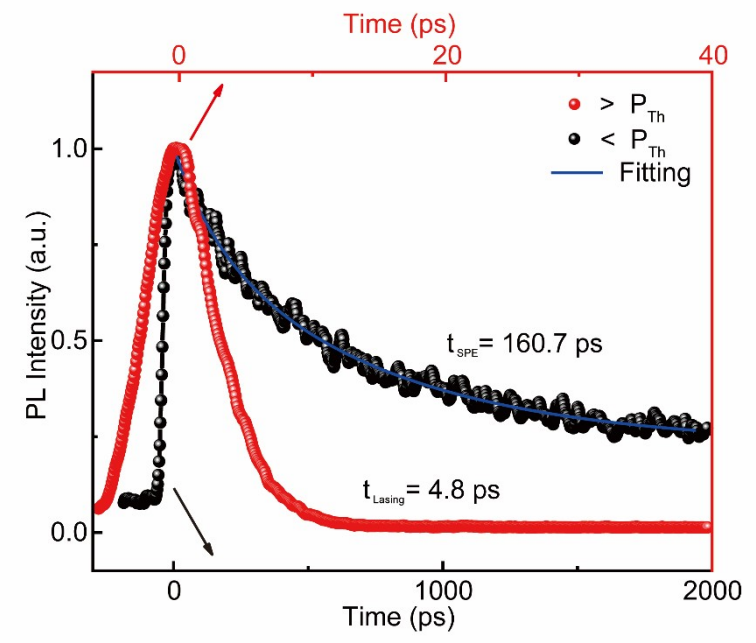

Figure S7. PL dynamics decay curves at pumping density of 0.8 P_{Th} and 1.8 P_{Th}, respectively. With the pumping density exceeding the threshold, the PL decay rate has increased.

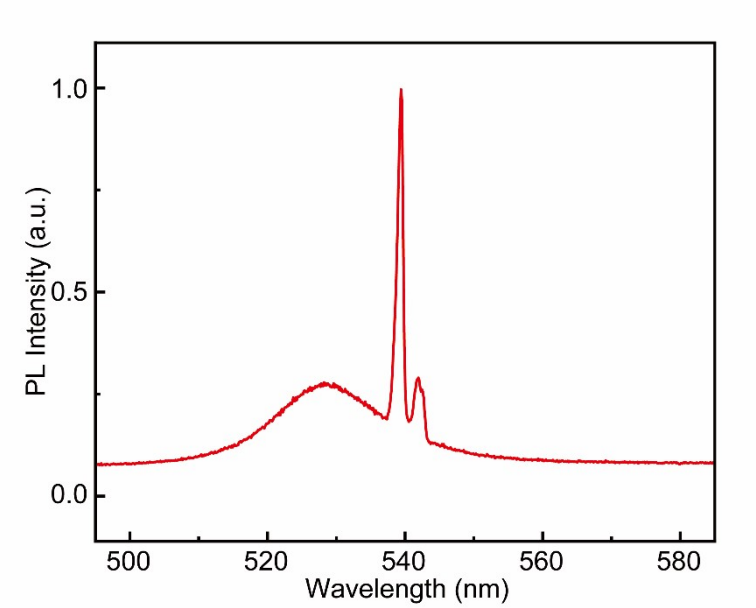

Figure S8. The larger-sized microrod exhibits multi-mode lasing emission under high pump density excitation.