

## Supporting Information

### **Sustainable Fabrication of Ultralong Pb(OH)Br Nanowires and their Conversion to Luminescent CH<sub>3</sub>NH<sub>3</sub>PbBr<sub>3</sub> Nanowires**

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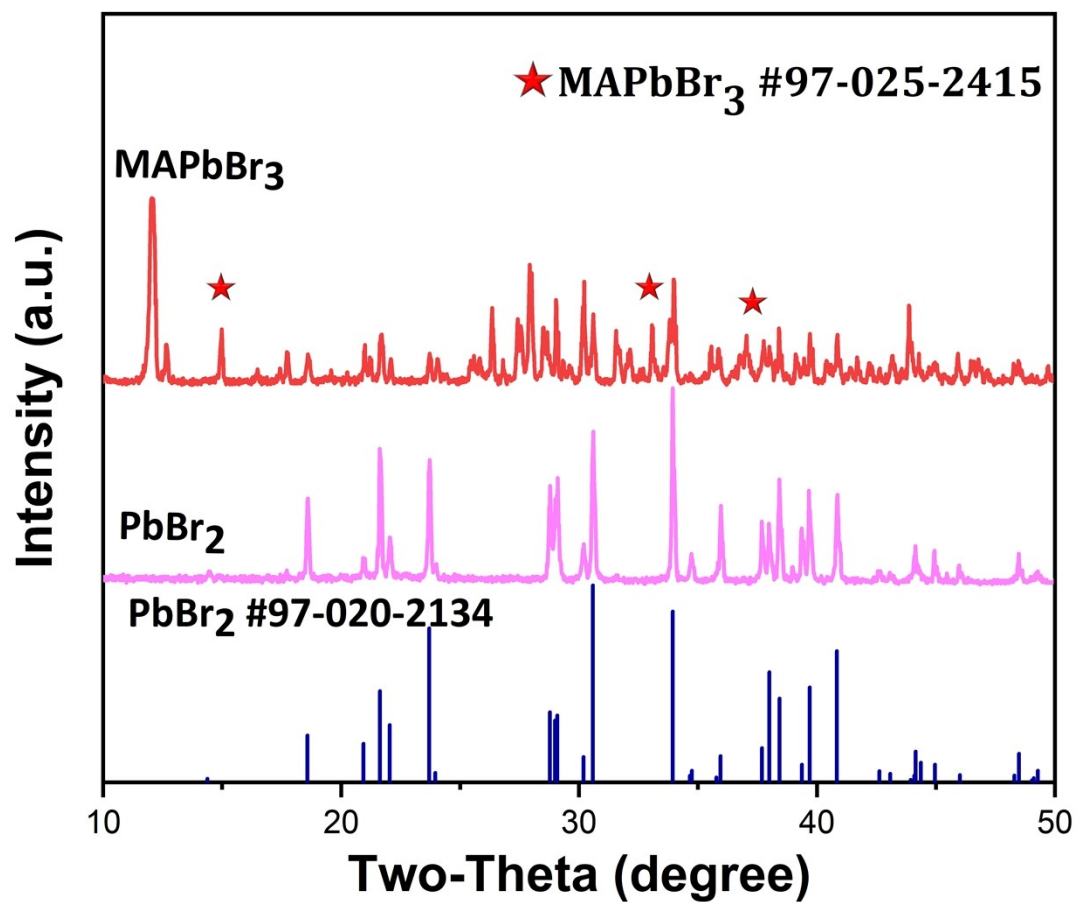
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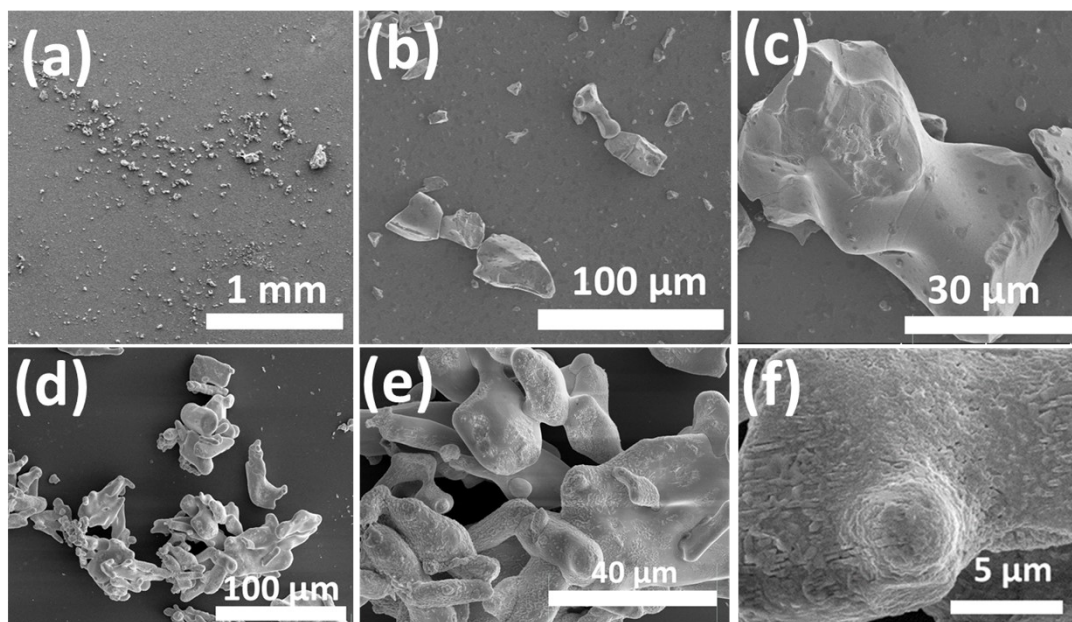
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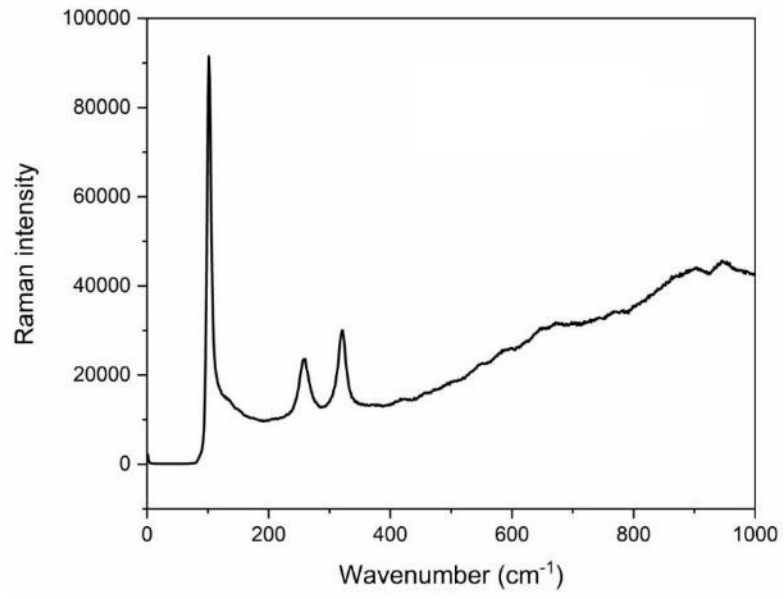
Supporting Figures:



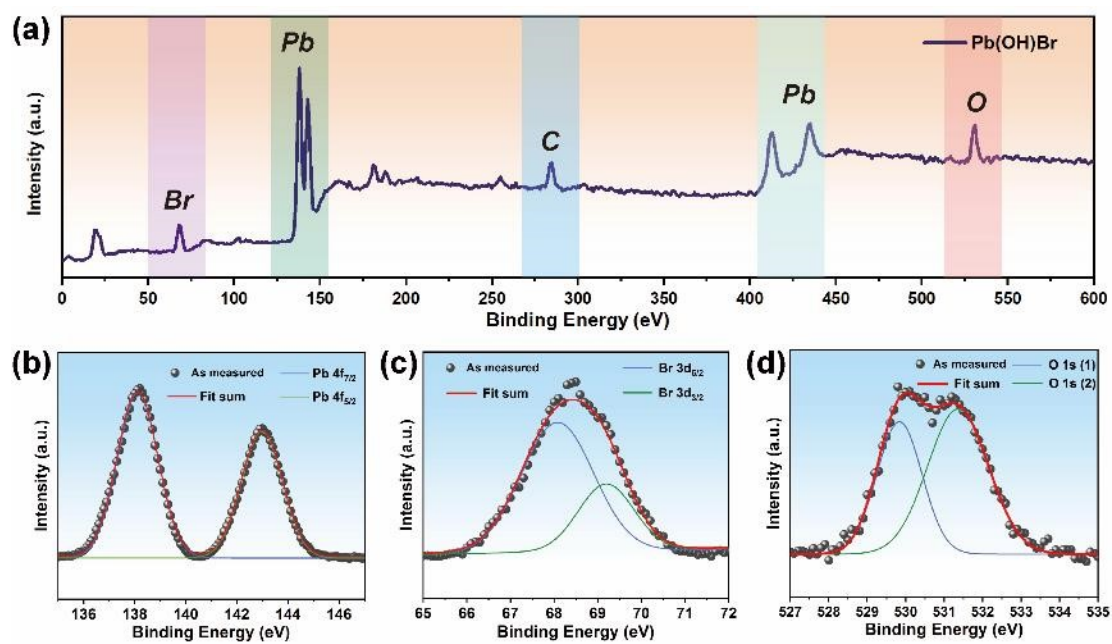
**Figure S1.** The XRD patterns of PbBr<sub>2</sub> and MAPbBr<sub>3</sub> prepared directly through reaction of PbBr<sub>2</sub> and MABr.



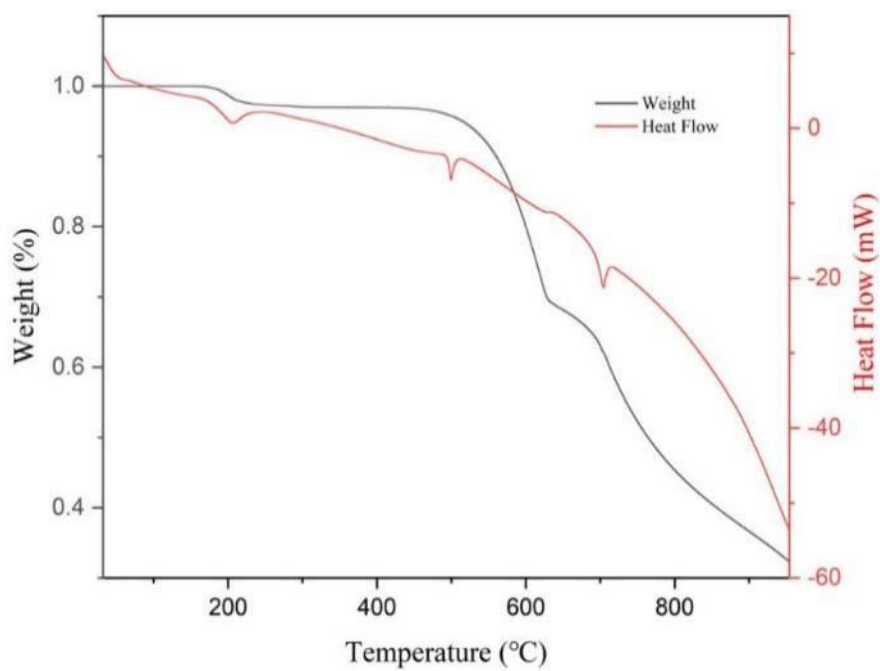
**Figure S2.** The SEM images of  $\text{PbBr}_2$  (a,b,c) and  $\text{MAPbBr}_3$  (d,e,f) prepared directly through reaction of  $\text{PbBr}_2$  with MABr.



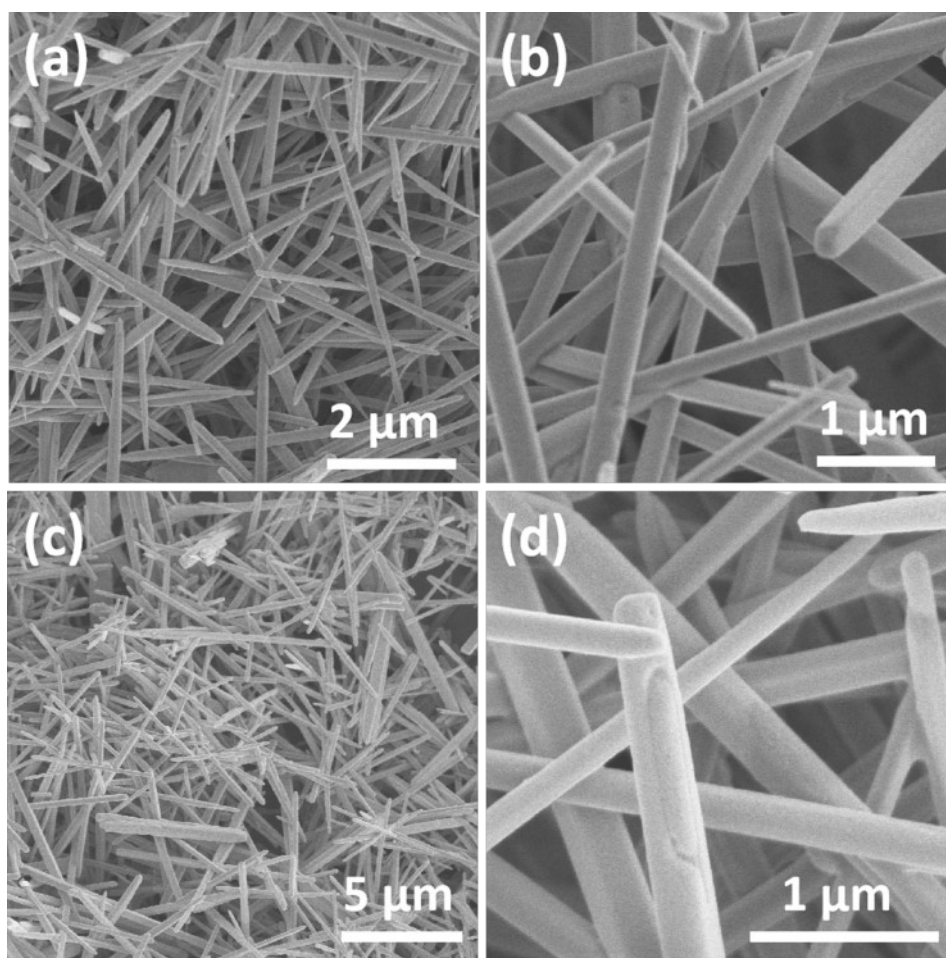
**Figure S3.** The Raman spectrum of the Pb(OH)Br nanowires.



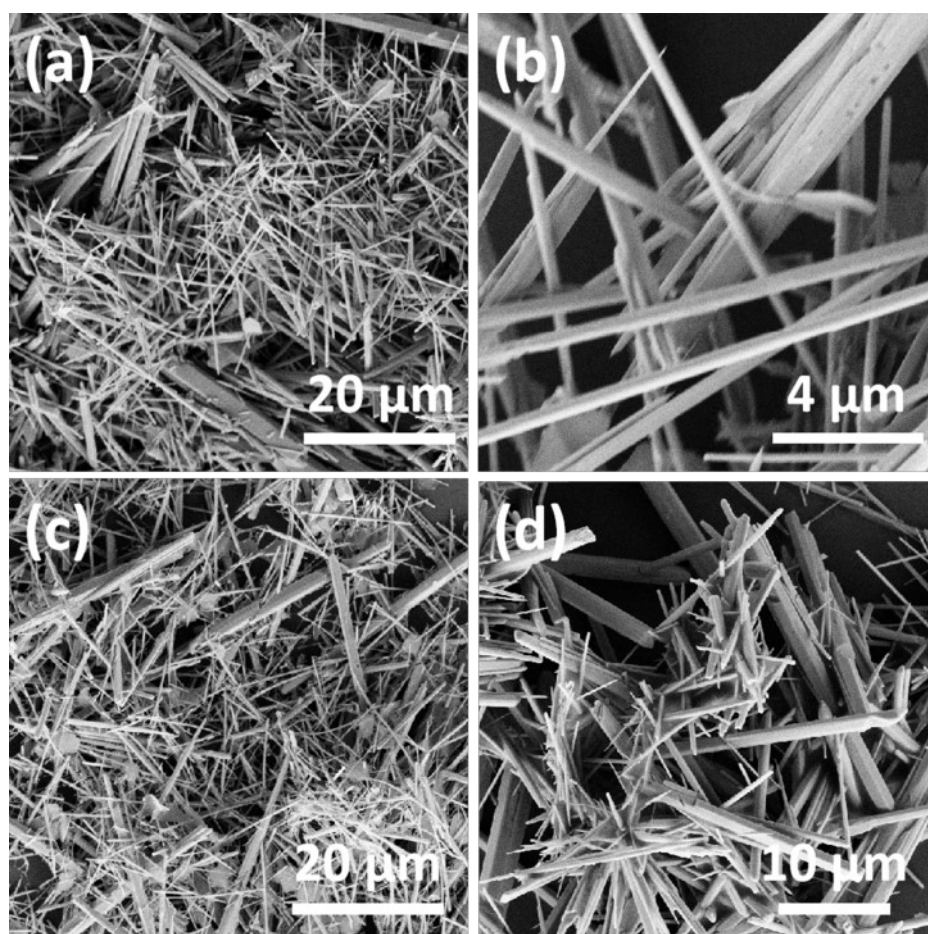
**Figure S4.** XPS spectra of Pb(OH)Br. (a) Element survey. (b) 4f of Pb. (c) 3d of Br. (d) 1s of O.



**Figure S5.** The TGA and DSC curves of the Pb(OH)Br nanowires.

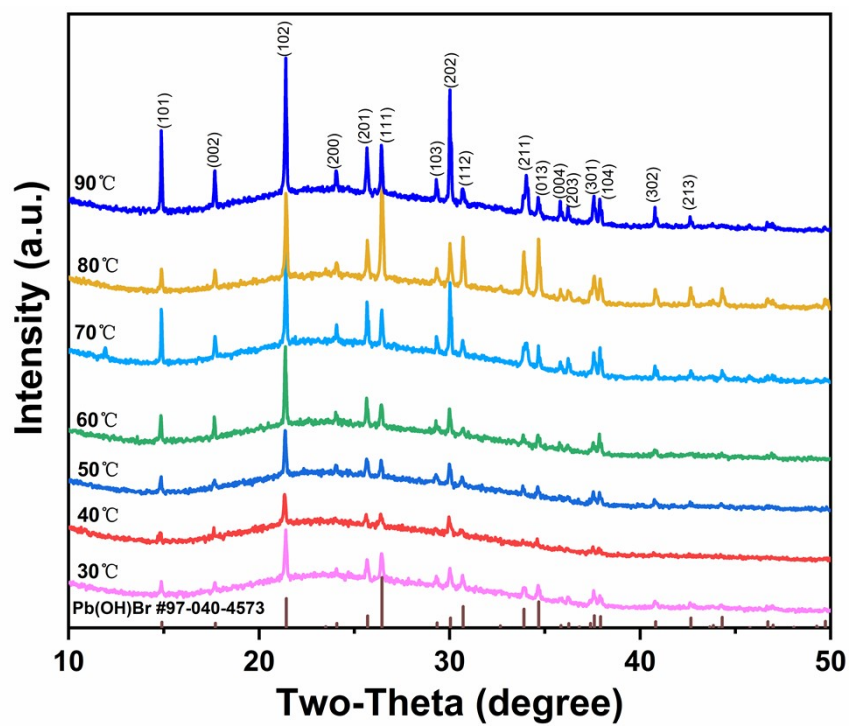


**Figure S6.** The SEM images of Pb(OH)Br microrods prepared at (a,b) 40 °C and (c,d) 50 °C.

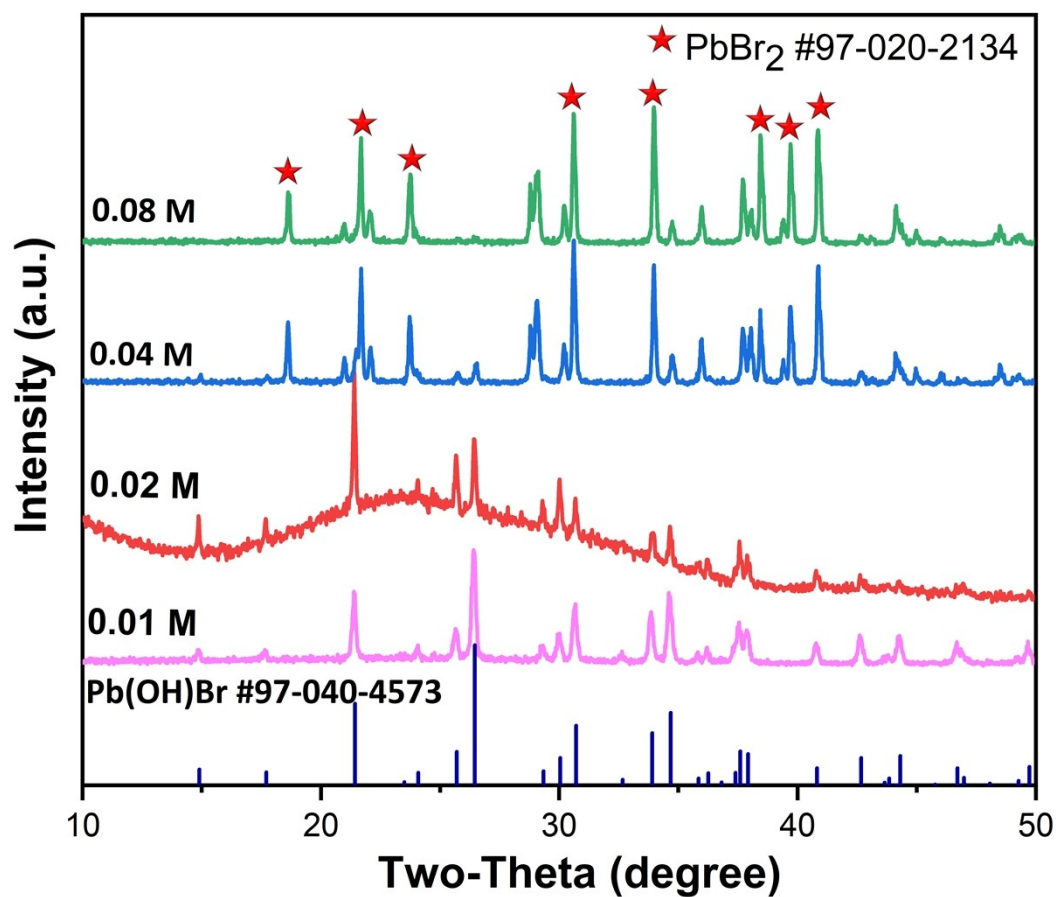


**Figure S7.** The SEM images of Pb(OH)Br nanowires prepared under (a) and (b) 70 °C and (c) and (d) 80 °C.

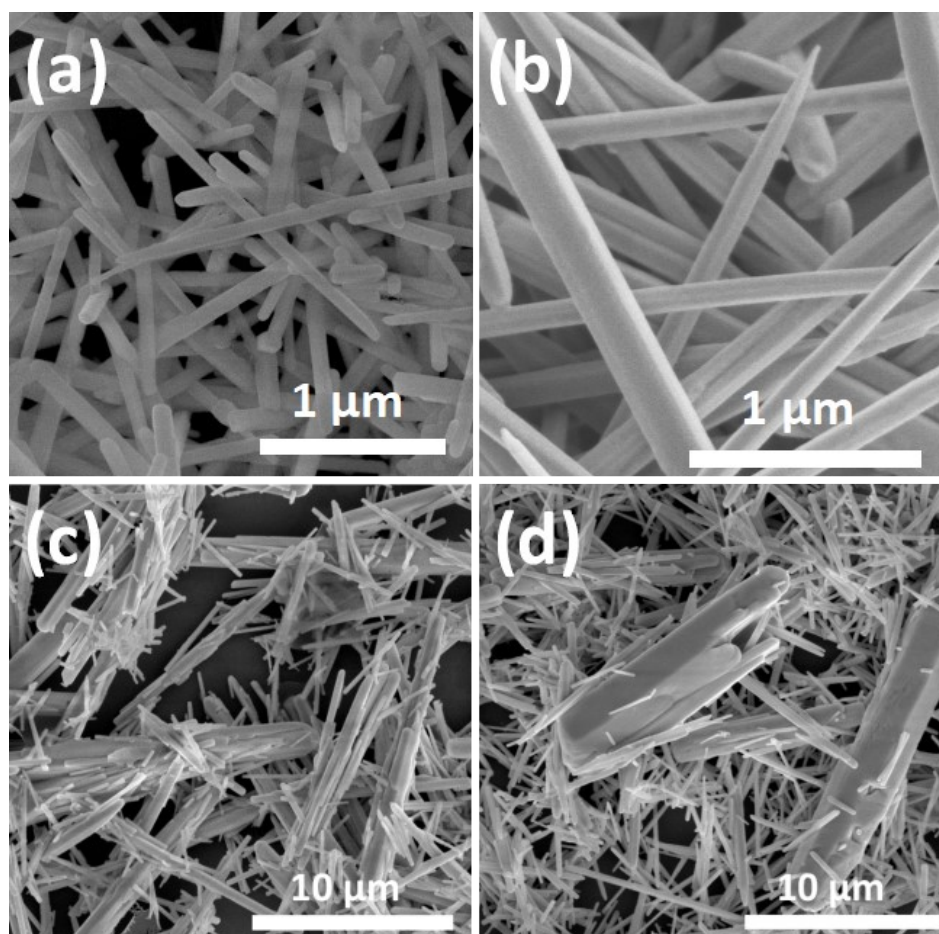




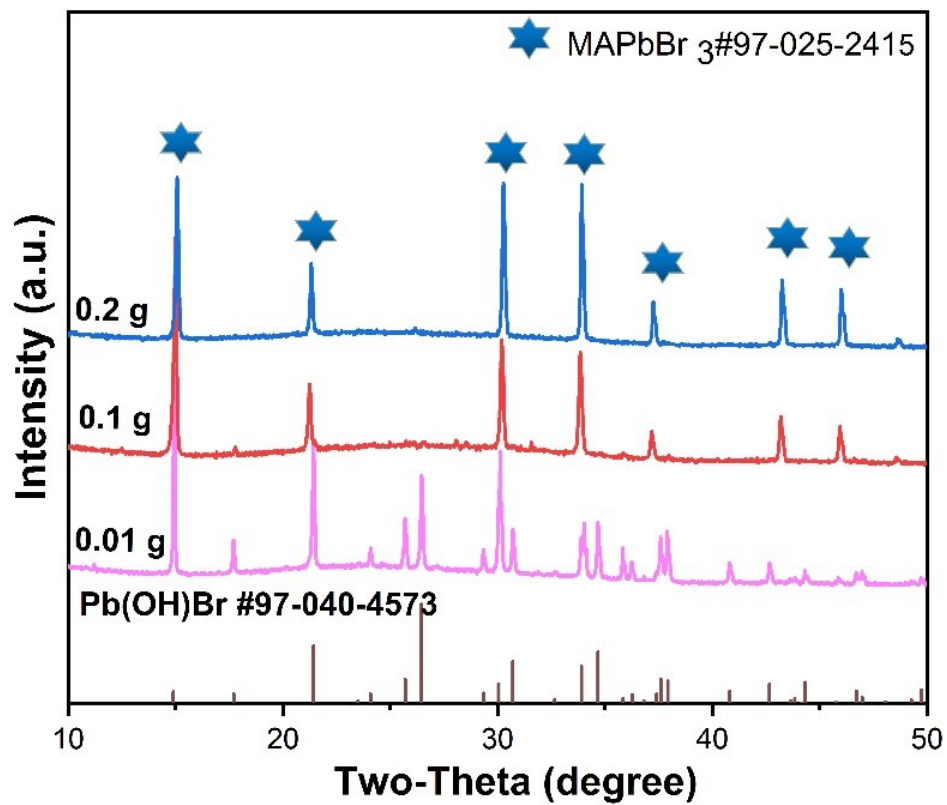
**Figure S8.** The XRD patterns of the Pb(OH)Br nanowires synthesized at different temperatures.



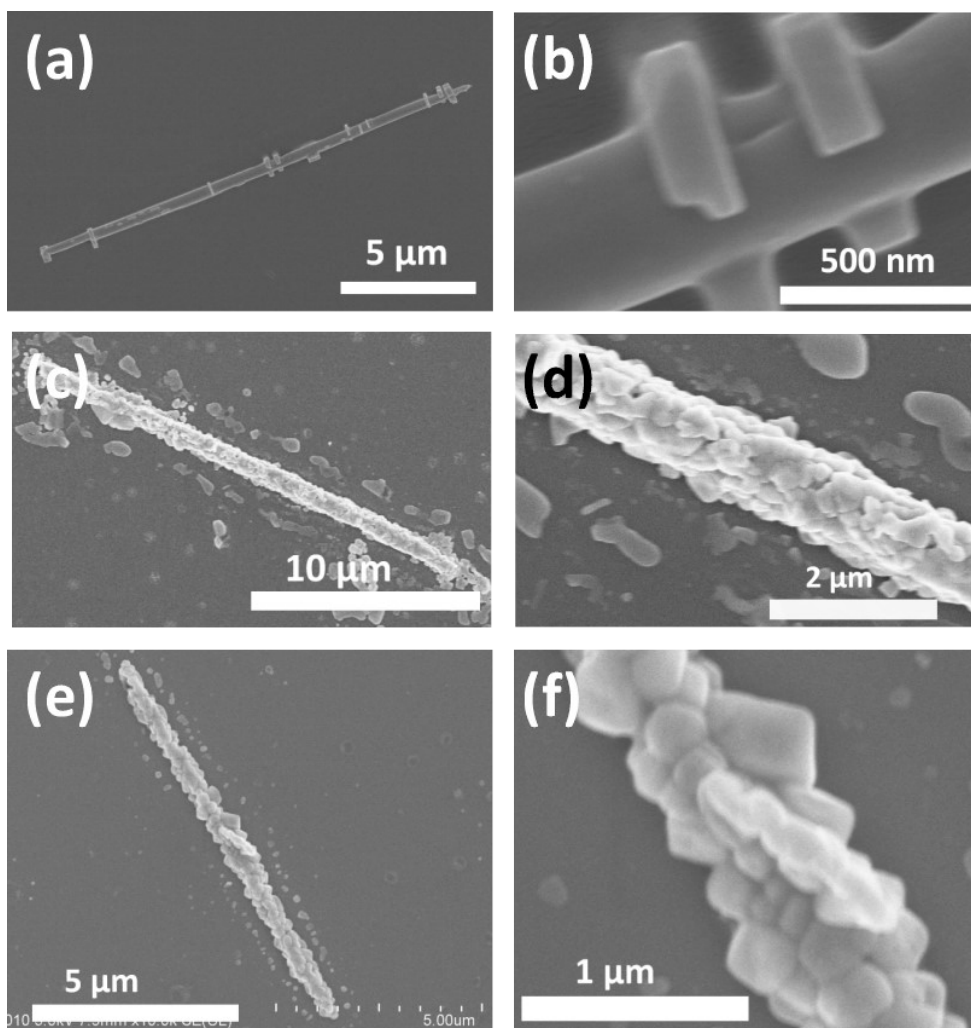
**Figure S9.** The XRD patterns of Pb(OH)Br nanowires prepared under different PbBr<sub>2</sub> concentration. 0.04 M and 0.08 M: Stirring for 15 minutes, 0.01 M and 0.02 M: Stirring for 5 minutes.



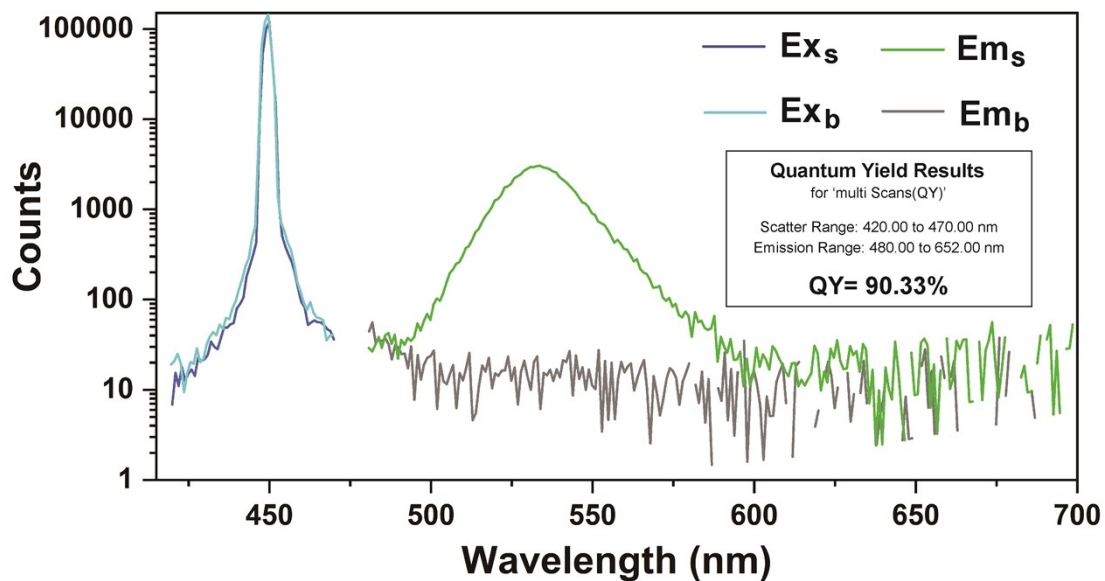
**Figure S10.** The SEM images of Pb(OH)Br nanowires prepared under different PbBr<sub>2</sub> concentration. (a) 0.01 M and (b) 0.02 M: Stirring for 5 minutes, (c) 0.04 M and (d) 0.08 M. 0.04 M and 0.08 M: Stirring for 15 minutes.



**Figure S11.** The XRD pattern of the Pb(OH)Br nanowires after reacting with different masses of MABr vapor



**Figure S12.** The SEM images of Pb(OH)Br nanowires after reacting with different masses of MABr vapor. ( a,b:0.01 g; c,d:0.1 g; e,f:0.2 g)



**Figure S13.** The PLQY of the MAPbBr<sub>3</sub> nanowires. Em<sub>s</sub> represents the emission of the sample that collects the photons emitted by the product; Em<sub>b</sub> is the blank emission performed with a blank quartz plate in the same spectral range used for the Em<sub>s</sub> measurement; the Ex<sub>s</sub> is the excitation of a sample, which records the photons that are not absorbed by the sample; Ex<sub>b</sub> represents the blank excitation, which are the photons going through the blank. For each sample, the above four measurements were recorded and we can get the corresponding PLQY value.

**Table S1:** Comparison of photoluminescence quantum yield (PLQY) performance of MAPbBr<sub>3</sub> in this work with previous reports.

Perovskite NCs	PLQY solution	Ref
MAPbBr <sub>3</sub>	90.33%	This work
MAPbBr <sub>3</sub>	10-32%	1
MAPbBr <sub>3</sub>	83%	2
MAPbI <sub>2</sub> Br	60-85%	3
MAPbI <sub>3</sub>	46%	4

**References:**

1. C. Geng, S. Xu, H. Zhong, A. Rogach and W. Bi, *Angew. Chem.*, 2018, **130**, 9798-9802.
2. S. Gonzalez-Carrero, R. Galian and J. Pérez-Prieto, *J. Mater. Chem. A.*, 2015, **3**, 9187-9193..
3. Y. Hassan, O. Ashton, J. Park, G. Li, N. Sakai, B. Wenger, A. Haghighirad, N. Noel, M. Song, B. Lee, R. Friend and H. Snaith, *J. Am. Chem. Soc.*, 2019, **141**, 1269-1279.
4. F. Zhang, S. Huang, P. Wang, X. Chen, S. Zhao, Y. Dong, and H. Zhong, *Chem. Mater.*, 2017, **29**, 3793-3799.