

## Supporting Information for: Tailoring the lasing modes in $\text{CH}_3\text{NH}_3\text{PbBr}_3$ perovskite microplates via micro-manipulation

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## 1. Size distributions of the synthesized $\text{CH}_3\text{NH}_3\text{PbBr}_3$ microplates

As the lasing mode numbers of  $\text{CH}_3\text{NH}_3\text{PbBr}_3$  microplates are related to their sizes, we have also counted their size distributions. **Figure S1** shows the sizes of microplates in Figure 1(a) of the main text. We can see that the side-lengths of most samples are a few microns. Here we exclude the relatively thick squares, as the thresholds of them are usually much higher than the thin samples due to their relatively low quality.

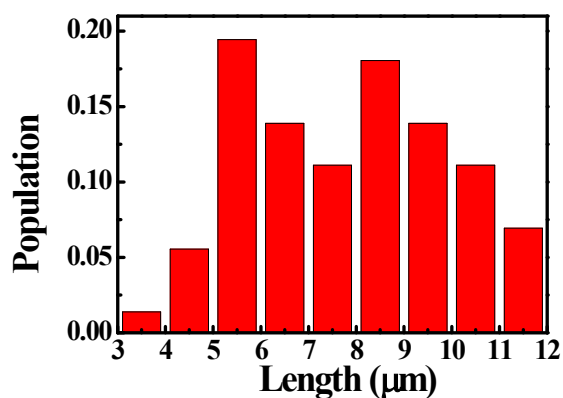
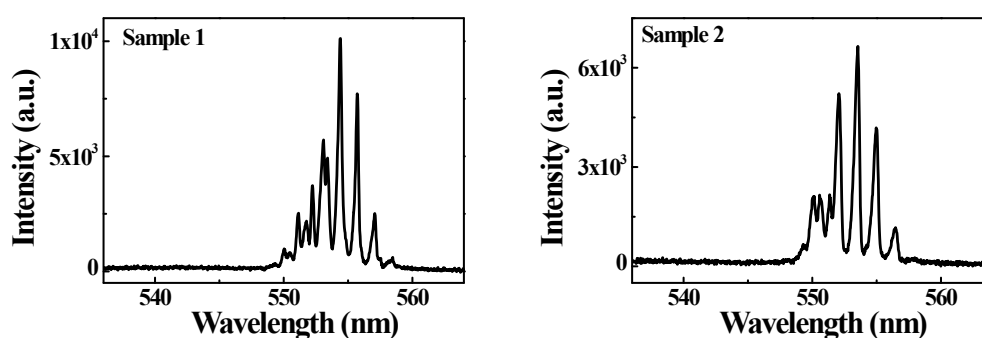


Figure S1: Size distributions of the side-length of square microplates of  $\text{CH}_3\text{NH}_3\text{PbBr}_3$ .

## 2. Lasing spectra of 10 different samples

To count the lasers wavelength of the synthesized  $\text{CH}_3\text{NH}_3\text{PbBr}_3$  samples, we randomly pump 10 different single squares and obtain their lasing spectra. Both of the pumping density is above their threshold. As shown in **Figure S2**, all the lasing peaks are around 553nm with a range between 7 nm and 15 nm. The samples 1-9 are pumped at  $7 \mu\text{J}/\text{cm}^2$ , and the spectra of sample 10 is the inset of Figure 3(c) in the main text.



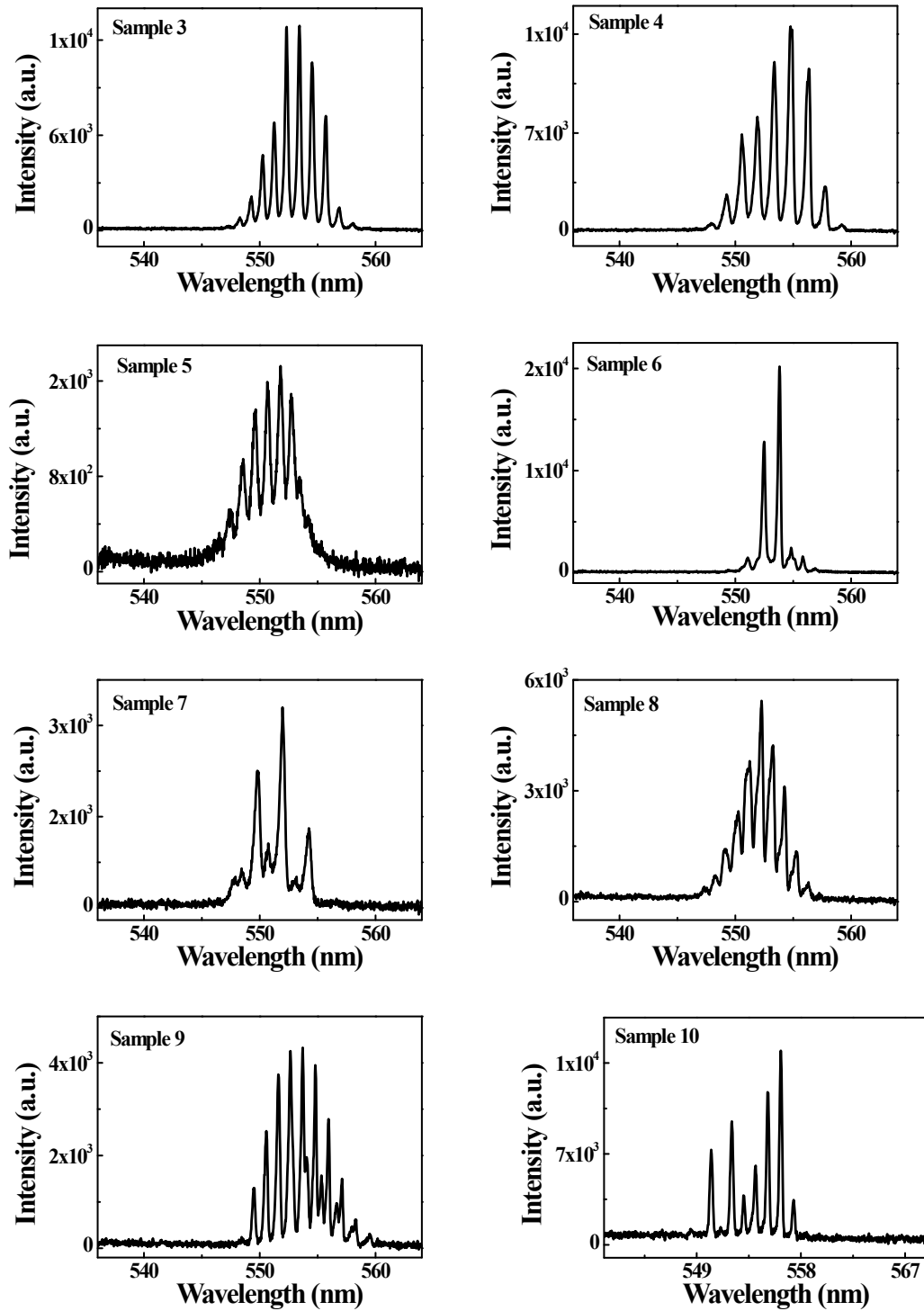


Figure S2: Lasing spectra of 10 different single  $\text{CH}_3\text{NH}_3\text{PbBr}_3$  microplates. Both of the samples 1-9 are pumped at  $7 \mu\text{J}/\text{cm}^2$ , which is above their thresholds. The spectrum of sample 10 is the Inset of Figure 3(c) in the main text, with pumping density at  $6.64 \mu\text{J}/\text{cm}^2$ .

### 3. Other samples with single mode emission

In the main text, we mentioned that the single-mode emission of the double microplates was quite generic in microplates with size around  $10 \mu\text{m}$  and relatively narrow gain spectral

region. Here we show two additional examples of single mode operation. All the results are shown in Figure S3. The narrow peaks and superlinear slope in Figure 3 clearly show the lasing actions of two contacted squares. The inset in Figure S3(b) shows the high resolution spectrum at pumping density  $24.5 \mu\text{J}/\text{cm}^2$ . We can see that one peak dominates the laser spectrum very well. And the extinction ratio is also around 9 dB. Meanwhile, the fluorescent microscope image in Figure 3(b) shows two bright spots at two sides of the lasing microplate. Similar to the observation in the main text, we can see that the diamond whispering-gallery modes are all suppressed and only Fabry-Perot modes are left in the contacted microplates.

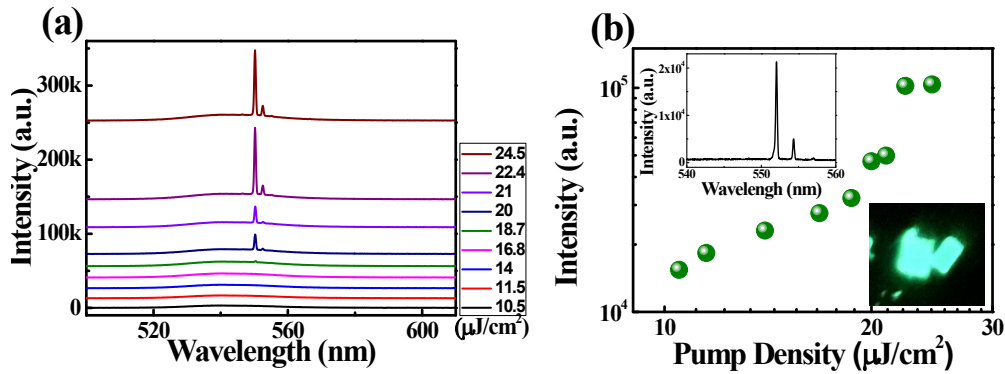


Figure S3: The other double  $\text{CH}_3\text{NH}_3\text{PbBr}_3$  microplates with nearly single mode emission. (a) The emission spectra at different pumping density, respectively. (b) The corresponding output power as a function of pumping density. Insets are the high resolution spectra and fluorescent microscope images above the threshold.