

## Supplementary Information

### **Ultrasound-activated luminescence with color tunability enabled by mechanoluminescent colloids and perovskite quantum dots**

Fan Yang<sup>1,2</sup>, Han Cui<sup>1,2</sup>, Xiang Wu<sup>1,2</sup>, Seong-Jong Kim<sup>3</sup>, and Guosong Hong<sup>1,2,\*</sup>

<sup>1</sup> Department of Materials Science and Engineering, Stanford University, Stanford, CA, 94305, USA

<sup>2</sup> Wu Tsai Neurosciences Institute, Stanford University, Stanford, CA, 94305, USA

<sup>3</sup> Department of Materials Science and Engineering, Pohang University of Science and Technology (POSTECH), 77 Cheongam-ro, Nam-gu, Pohang, Gyeongbuk, 37673, Republic of Korea

\* Corresponding author: [guosongh@stanford.edu](mailto:guosongh@stanford.edu)

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Supplementary Note

Supplementary Figures 1 to 5

Supplementary References

## Supplementary Note

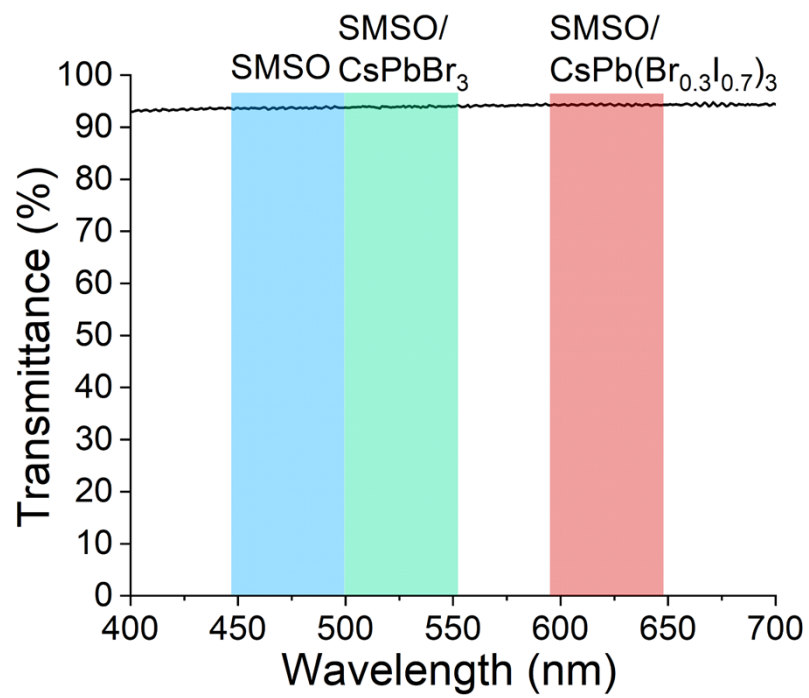
### Calculation of the quantum yield (QY) of PQD@SiO<sub>2</sub>

The QY of PQD@SiO<sub>2</sub> is calculated as follows:

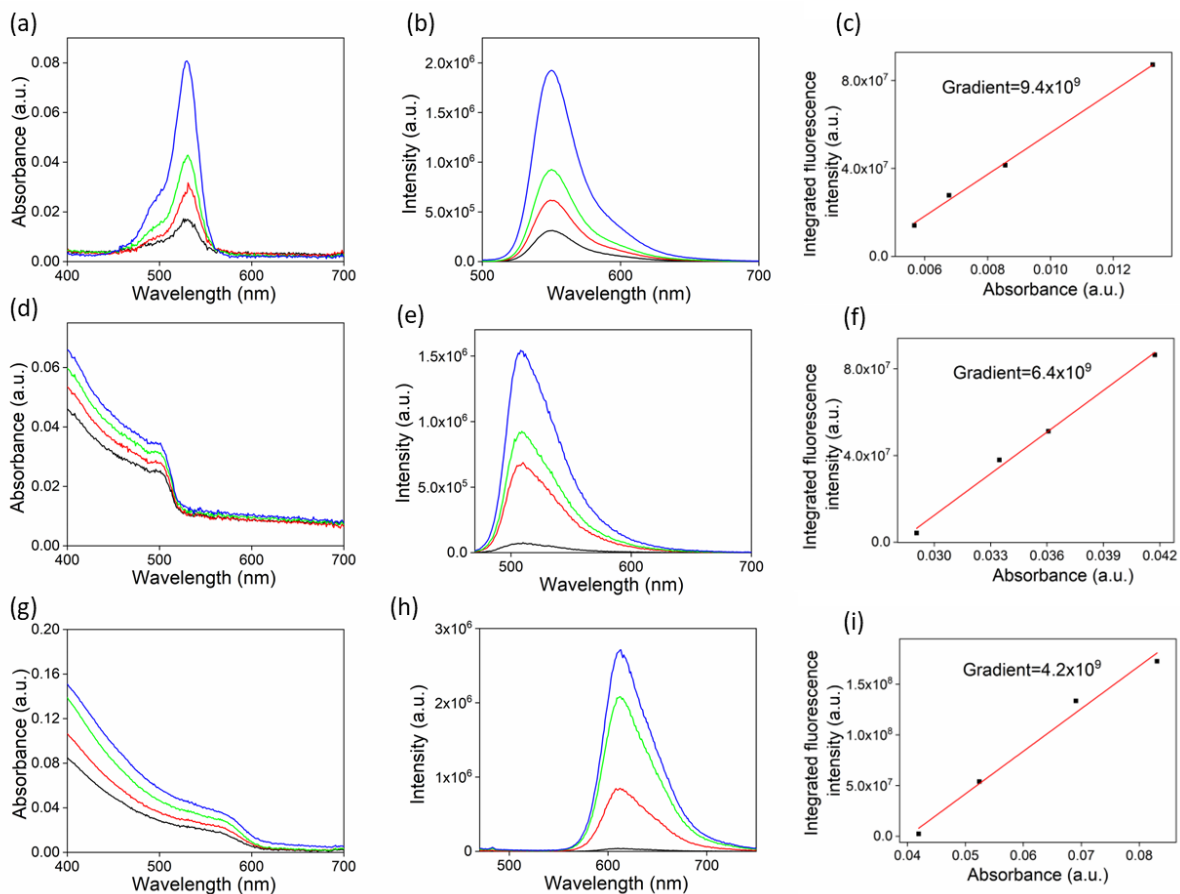
$$QY = QY_{Ref} \cdot \left( \frac{Grad}{Grad_{Ref}} \right) \cdot \left( \frac{n}{n_{Ref}} \right)^2$$

where  $QY_{Ref}$  is the QY of the reference, Rhodamine 6G dissolved in ethanol;  $Grad$  and  $Grad_{Ref}$  are the gradient of the linear-fitted integrated fluorescence intensity against absorbance for PQD@SiO<sub>2</sub> and reference, respectively;  $n$  and  $n_{Ref}$  are the refractive index of the solvent of the PQD@SiO<sub>2</sub> sample and the reference, respectively.<sup>1</sup>

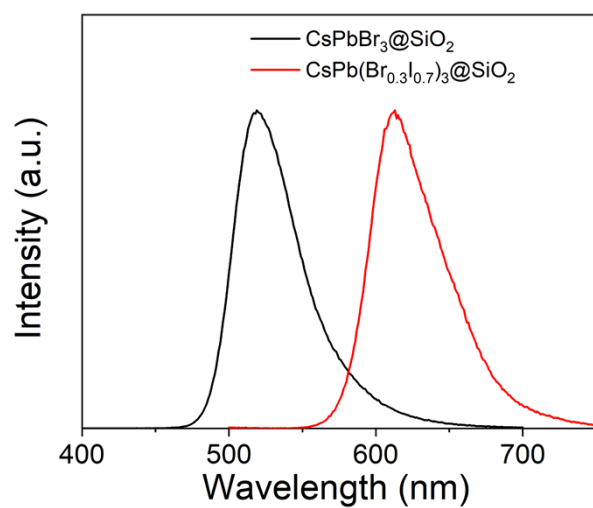
In this calculation, the QY of Rhodamine 6G in ethanol is 95%.<sup>2</sup>  $n$  and  $n_{Ref}$  are 1.49 and 1.36, corresponding to the solvent of toluene and ethanol, respectively. The gradient of fluorescence intensity against absorbance of each sample can be obtained from linear fitting (see **Fig. S2** below). The QYs of CsPbBr<sub>3</sub>@SiO<sub>2</sub> and CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub> are calculated to be 78% and 51%, respectively.



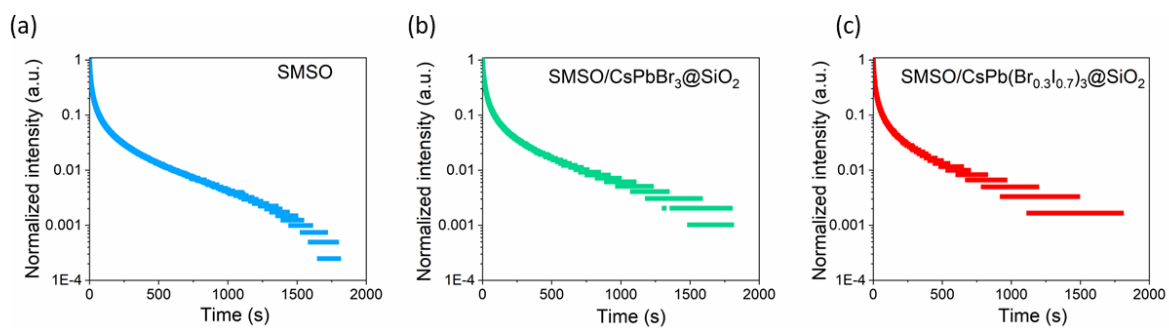
**Fig. S1.** Transmission spectra of PDMS overlaid with the emission windows of SMSO, SMSO/CsPbBr<sub>3</sub>, and SMSO/CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>.



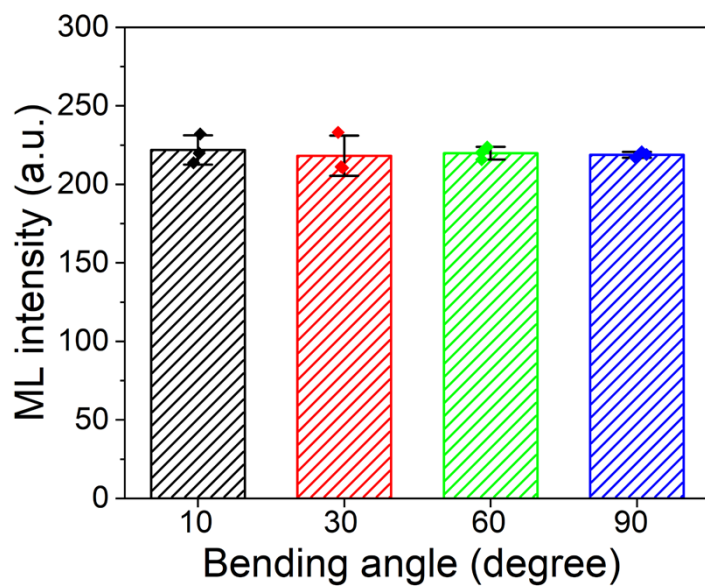
**Fig. S2.** UV-vis absorption spectra of Rhodamine 6G (a), CsPbBr<sub>3</sub>@SiO<sub>2</sub> (d) and CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub> (g); Fluorescence spectra of Rhodamine 6G (b), CsPbBr<sub>3</sub>@SiO<sub>2</sub> (e) and CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub> under an excitation wavelength of 465 nm (h); The linear fitting of integrated fluorescence intensity against absorbance of Rhodamine 6G (c), CsPbBr<sub>3</sub>@SiO<sub>2</sub> (f) and CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub> (i); The absorbance values associated to each sample correspond to absorbance at 465 nm.



**Fig. S3.** Photoluminescence spectra of CsPbBr<sub>3</sub>@SiO<sub>2</sub> and CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub>.



**Fig. S4.** Luminescence decay curves of three primary color pixels containing SMSO colloids alone (a), SMSO/CsPbBr<sub>3</sub>@SiO<sub>2</sub> composites (b), and SMSO/CsPb(Br<sub>0.3</sub>I<sub>0.7</sub>)<sub>3</sub>@SiO<sub>2</sub> composites (c).



**Fig. S5.** Mechanoluminescence intensity of the flexible pixel array with different bending angles under FUS. Each group contains  $n=3$  independent measurements. Data are presented as mean  $\pm$  standard deviation (S.D.).

**Reference:**

- 1 P. P. Sorokin, J. R. Lankard, V. L. Moruzzi and E. C. Hammond, *The Journal of Chemical Physics*, 1968, 48, 4726–4741.
- 2 R. F. Kubin and A. N. Fletcher, *J. Lumin.*, 1982, **27**, 455–462.