Supplementary Information

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

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Supplementary Note

Calculation of the quantum yield (QY) of PQD@SiO_2

The QY of PQD@SiO_2 is calculated as follows:

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

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_2 and reference, respectively; *n* and n_{Ref} are the refractive index of the solvent of the PQD@SiO_2 sample and the reference, respectively.[1]

In this calculation, the QY of Rhodamine 6G in ethanol is 95%.[2] *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 $CsPbBr_3$@SiO_2 and $CsPb(Br_{0.3}I_{0.7})_3$@SiO_2 are calculated to be 78% and 51%, respectively.

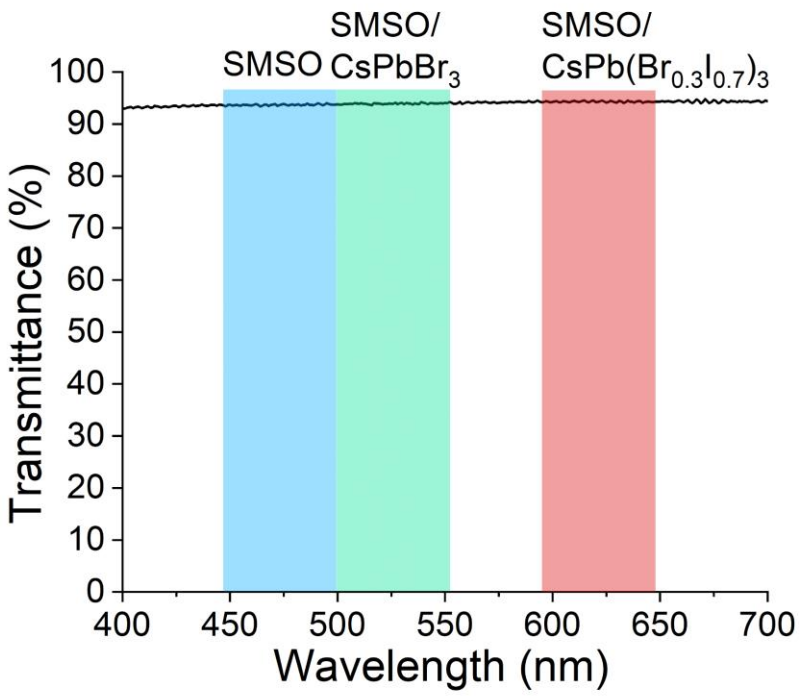

Fig. S1. Transmission spectra of PDMS overlaid with the emission windows of SMSO, SMSO/$CsPbBr_3$, and SMSO/$CsPb(Br_{0.3}I_{0.7})_3$.

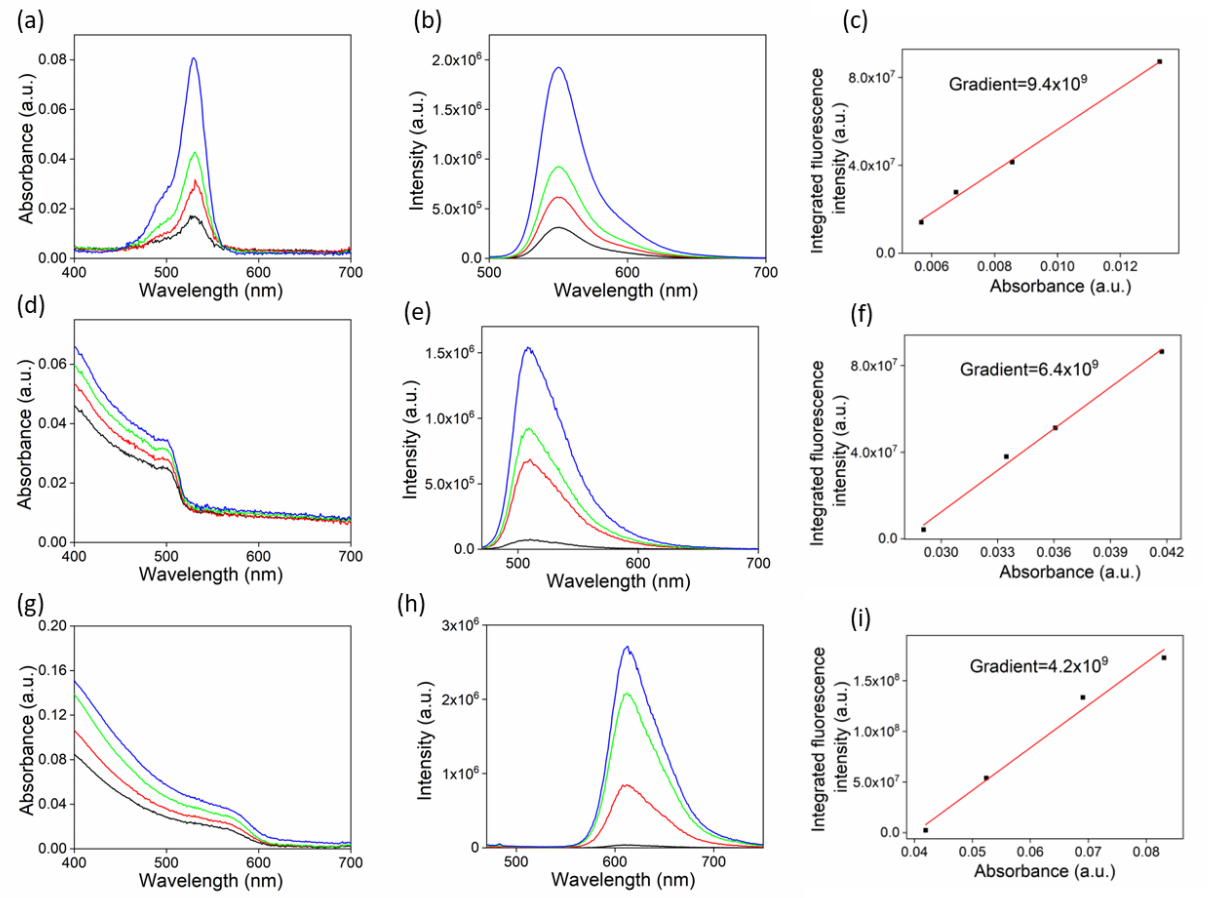

Fig. S2. UV-vis absorption spectra of Rhodamine 6G (**a**), $CsPbBr_3@SiO_2$ (**d**) and $CsPb(Br_{0.3}I_{0.7})_3@SiO_2$ (**g**); Fluorescence spectra of Rhodamine 6G (**b**), $CsPbBr_3@SiO_2$ (**e**) and $CsPb(Br_{0.3}I_{0.7})_3@SiO_2$ under an excitation wavelength of 465 nm (**h**); The linear fitting of integrated fluorescence intensity against absorbance of Rhodamine 6G (**c**), $CsPbBr_3@SiO_2$ (**f**) and $CsPb(Br_{0.3}I_{0.7})_3@SiO_2$ (**i**); The absorbance values associated to each sample correspond to absorbance at 465 nm.

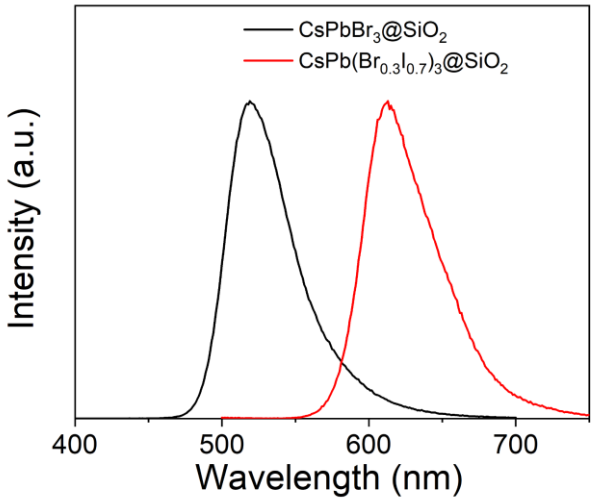

Fig. S3. Photoluminescence spectra of $CsPbBr_3@SiO_2$ and $CsPb(Br_{0.3}I_{0.7})_3@SiO_2$.

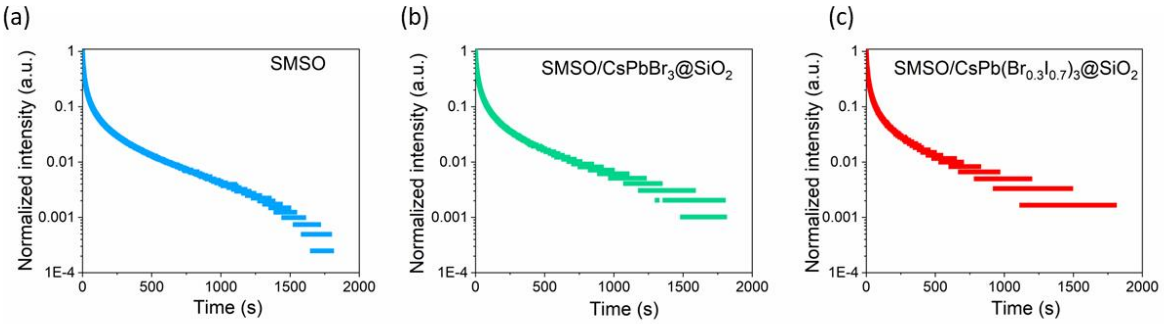

Fig. S4. Luminescence decay curves of three primary color pixels containing SMSO colloids alone (**a**), SMSO/$CsPbBr_3$@SiO_2 composites (**b**), and SMSO/$CsPb(Br_{0.3}I_{0.7})_3$@SiO_2 composites (**c**).

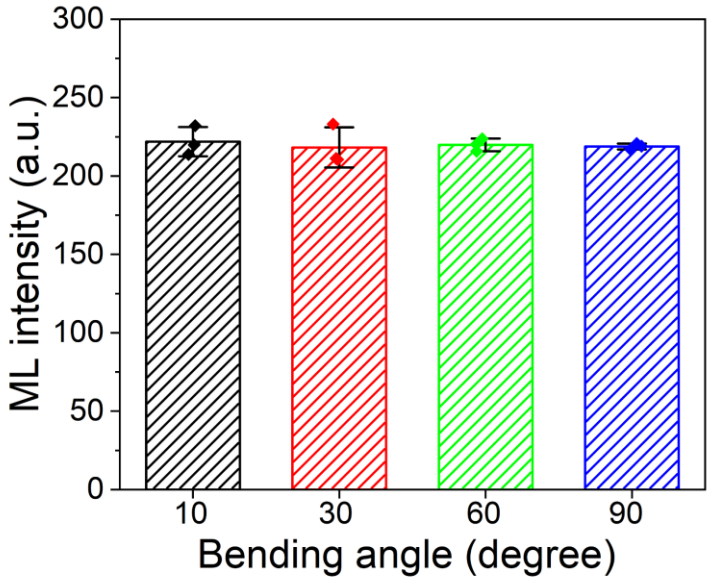

Fig. S5. Mechanoluminescence intensity of the flexible pixel array with different bending angles under FUS. Each group contains n=3 independent measurements. Data are presented as mean ± standard deviation (S.D.).

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.