ADVANCED OPTICAL MATERIALS

Supporting Information

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Template Pore Size and A-Site Cation Management Dictate Luminescence Efficiency, Stability, and Wavelength in Confined Perovskite Nanostructures

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Supporting Information

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Supporting Table S1. Particle and Pore Structure Information for the Mesoporous Silica Templates Used in this Work.

Supporting Figure S1. Fabrication route for $Cs_xMA_{x-1}PbBr_3$ / $Cs_xFA_{x-1}PbBr_3$ in mesoporous silica templates.

Supporting Figure S2. TEM Images and Histograms for selected perovskites templated by mesoporous silica.

Supporting Figure S3. Halder-Wagner plots for selected perovskites formed within 7 nm templates (a,b,c) and 4 nm templates (d,e,f,g,h).

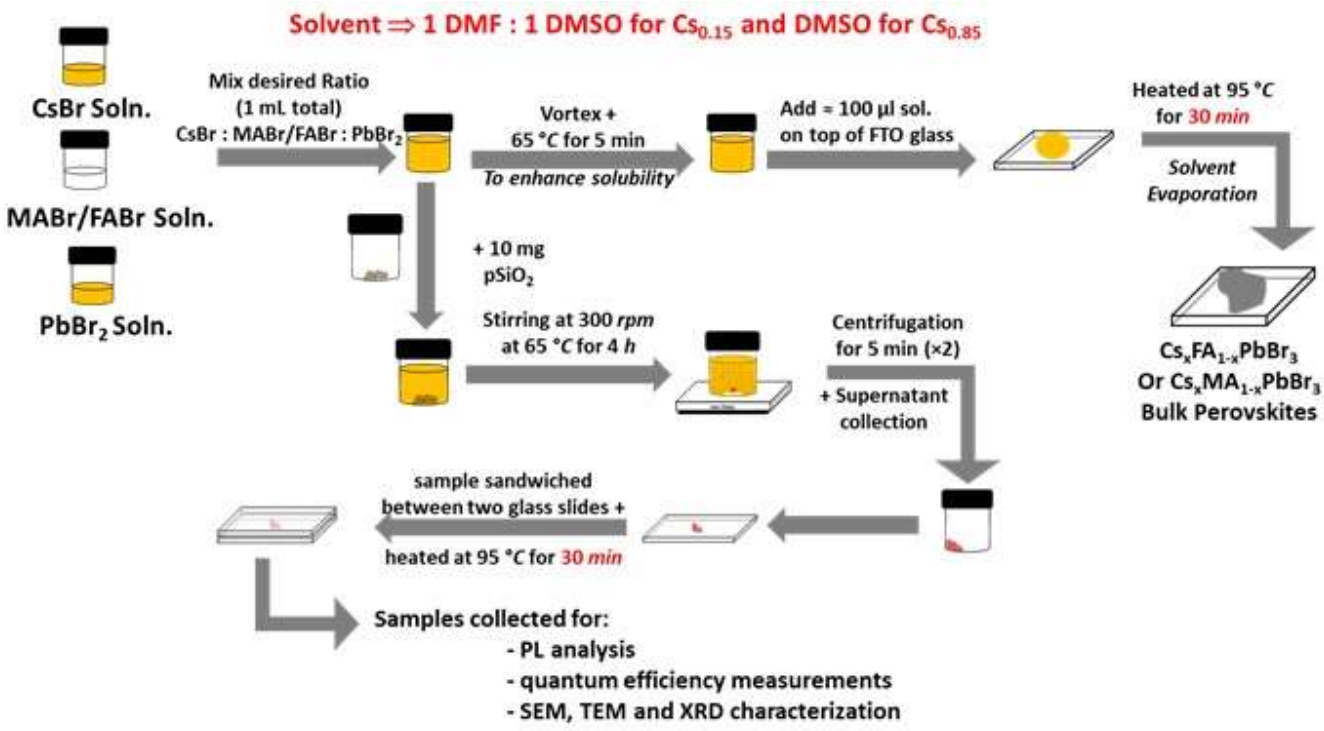
Supporting Figure S4. PL Spectra for *(a)* $FAPbBr_3$, *(b)* $MAPbBr_3$, and *(c)* $CsPbBr_3$ as function of template size.

Supporting Figure S5. PL Spectra for $Cs_xMA_{x-1}PbBr_3$ formed within mesoporous silica templates of (a) 4 nm and (b) 7 nm average pore diameter.

Supporting Figure S6. Fluence dependence of PLQE values for aged $Cs_{0.10}FA_{0.90}PbBr_3$ (CsFA) and $Cs_{0.10}MA_{0.90}PbBr_3$ (CsMA) structures formed within mesoporous silica templates of (a) 4 nm and (b) 7 nm average pore diameter.

Supporting Table S1. Particle and Pore Structure Information for the Mesoporous Silica Templates Used in this Work.

Property	4 nm pore template	7 nm pore template
Particle size	0.4-0.6 µm	0.5 µm
Pore volume	0.2-0.4 cm^3/g pore volume	0.91 cm^3/g pore volume
Surface area	300-400 m^2/g	~750 m^2/g (BET)



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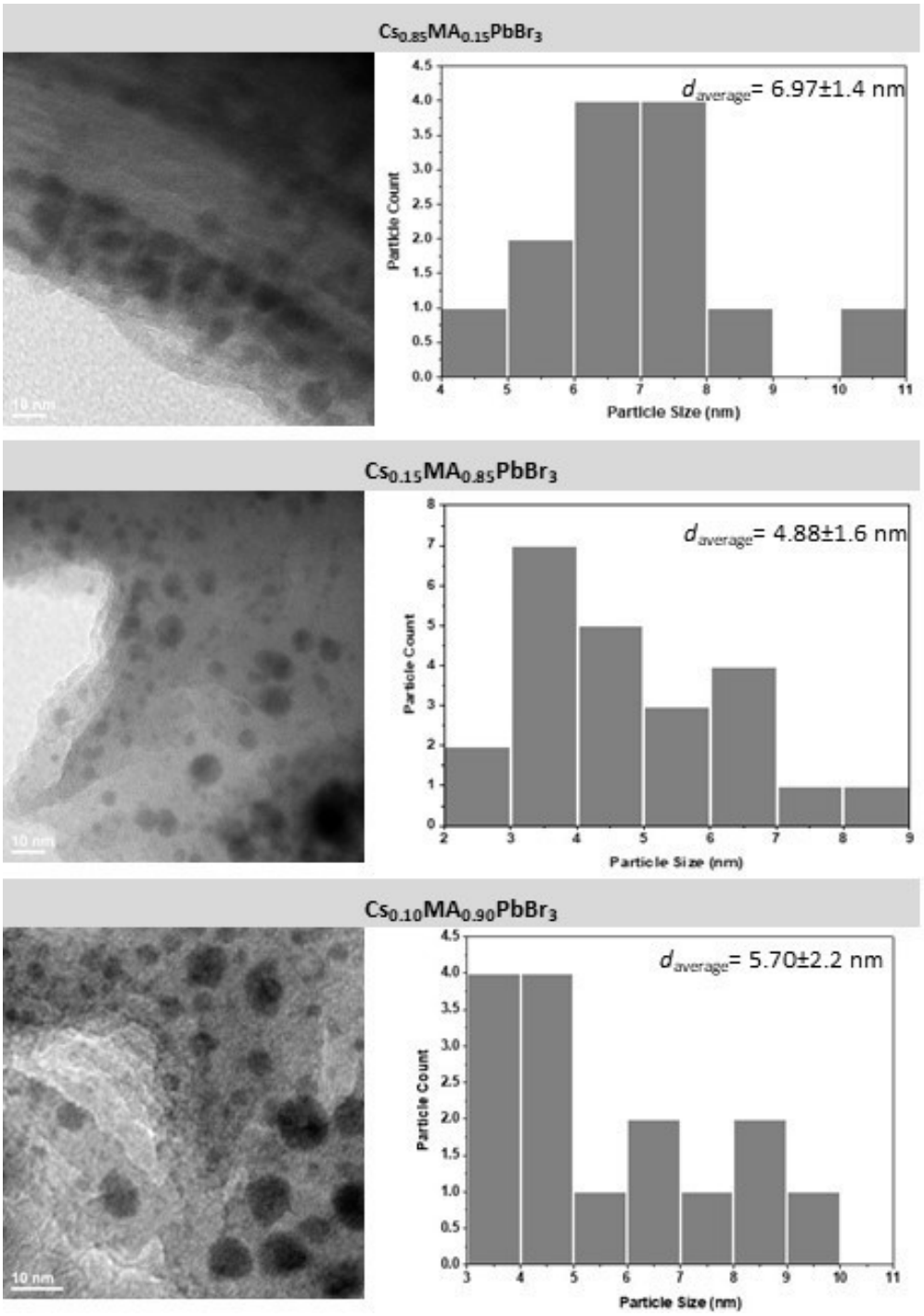
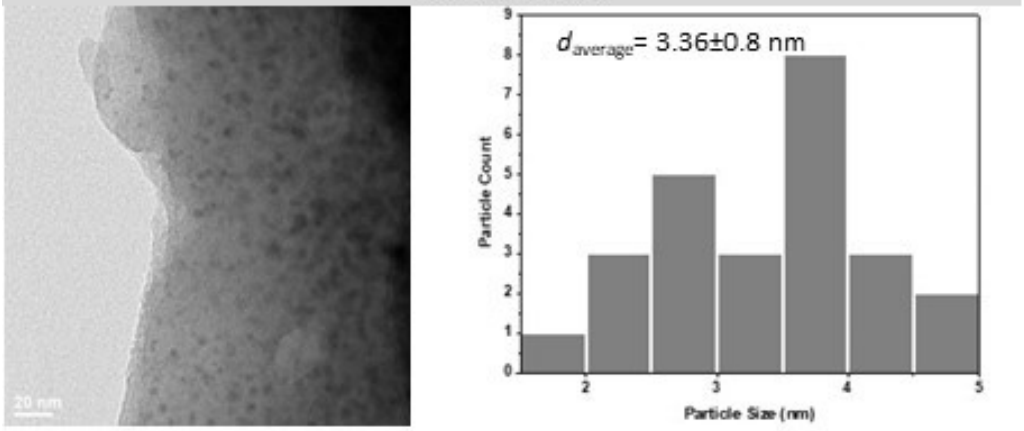
Supporting Figure S2. TEM Images and Histograms for selected perovskites templated by mesoporous silica.

(a) $Cs_xMA_{x-1}PbBr_3$ / SiO_2 (7 nm)

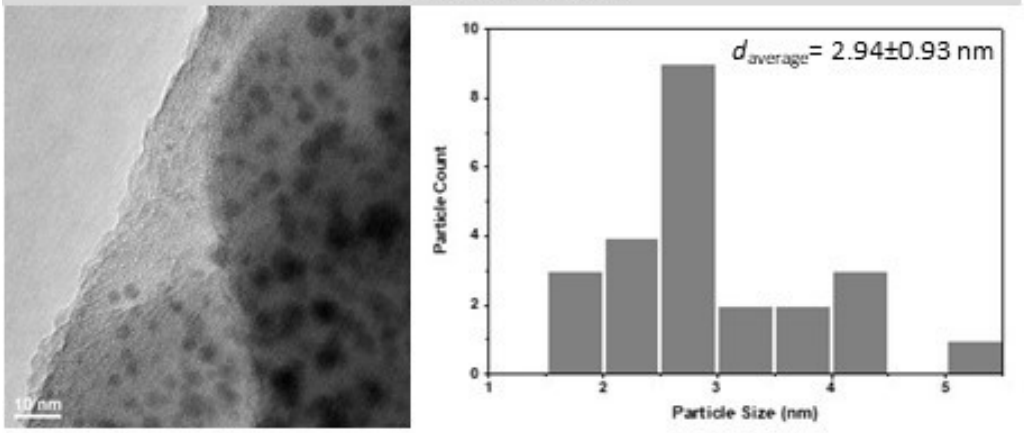


(b) $Cs_xMA_{x-1}PbBr_3$ / SiO_2 (4 nm)

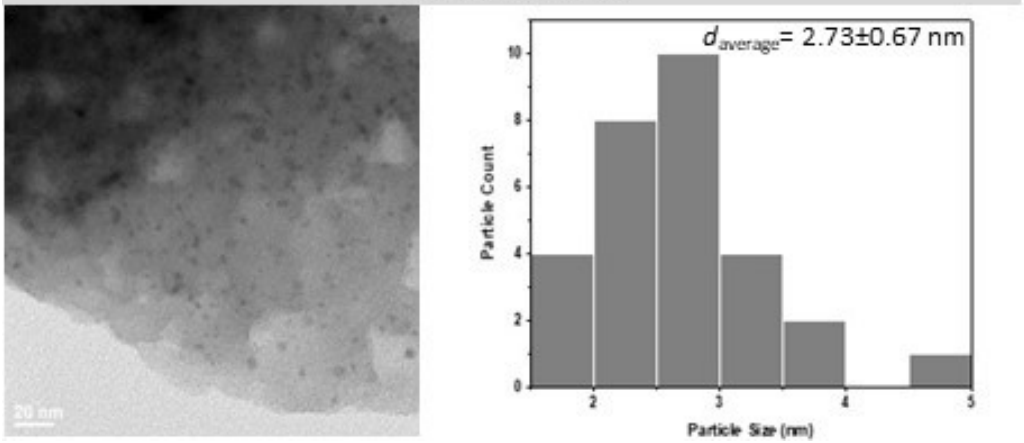
$Cs_{0.85}MA_{0.15}PbBr_3$



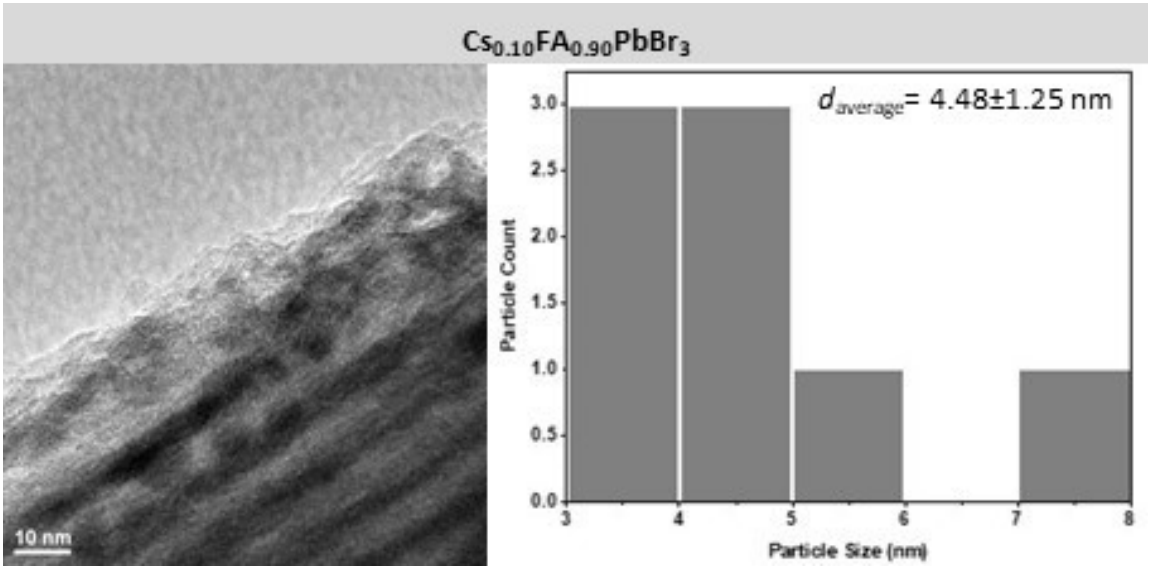
$Cs_{0.15}MA_{0.85}PbBr_3$



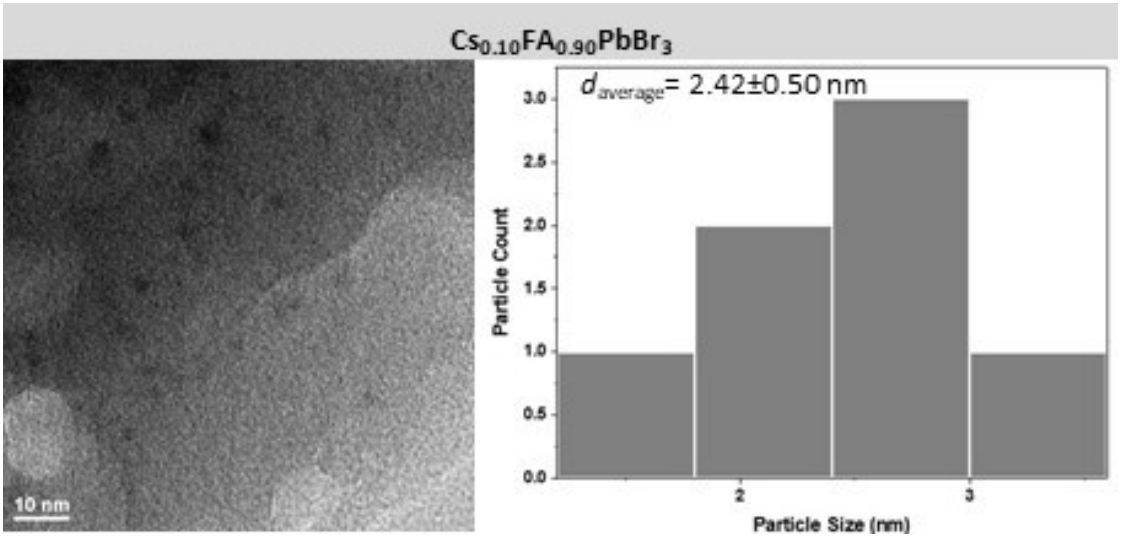
$Cs_{0.10}MA_{0.90}PbBr_3$

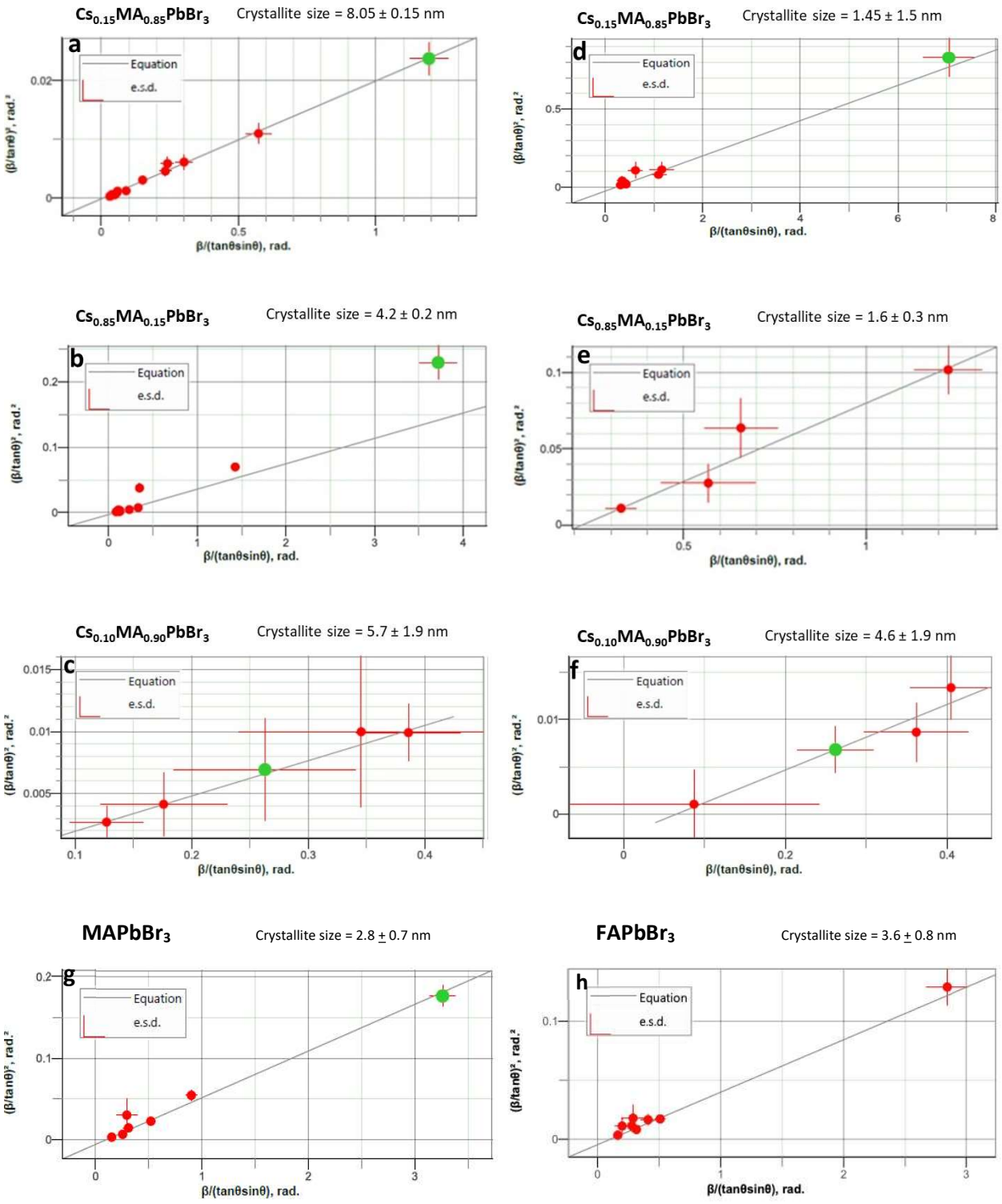


(c) $Cs_xFA_{x-1}PbBr_3$ / SiO_2 (7 nm)



(d) $Cs_xFA_{x-1}PbBr_3$ / SiO_2 (4 nm)





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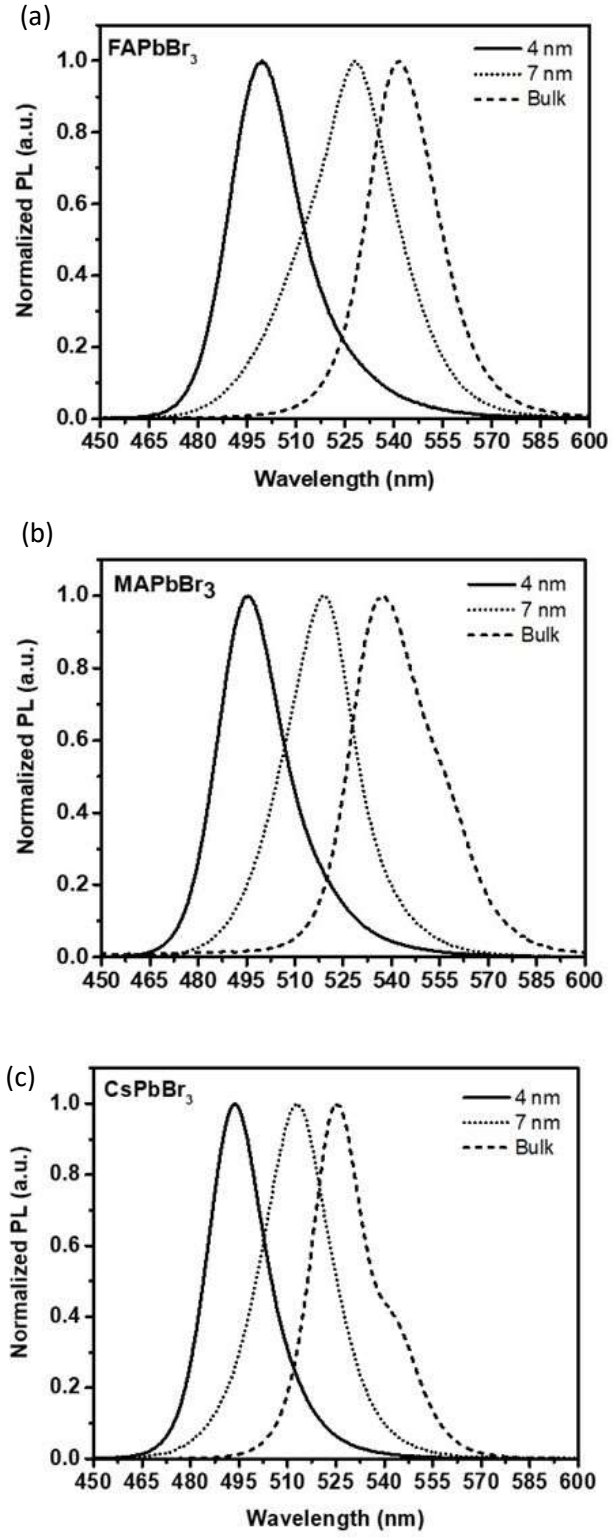

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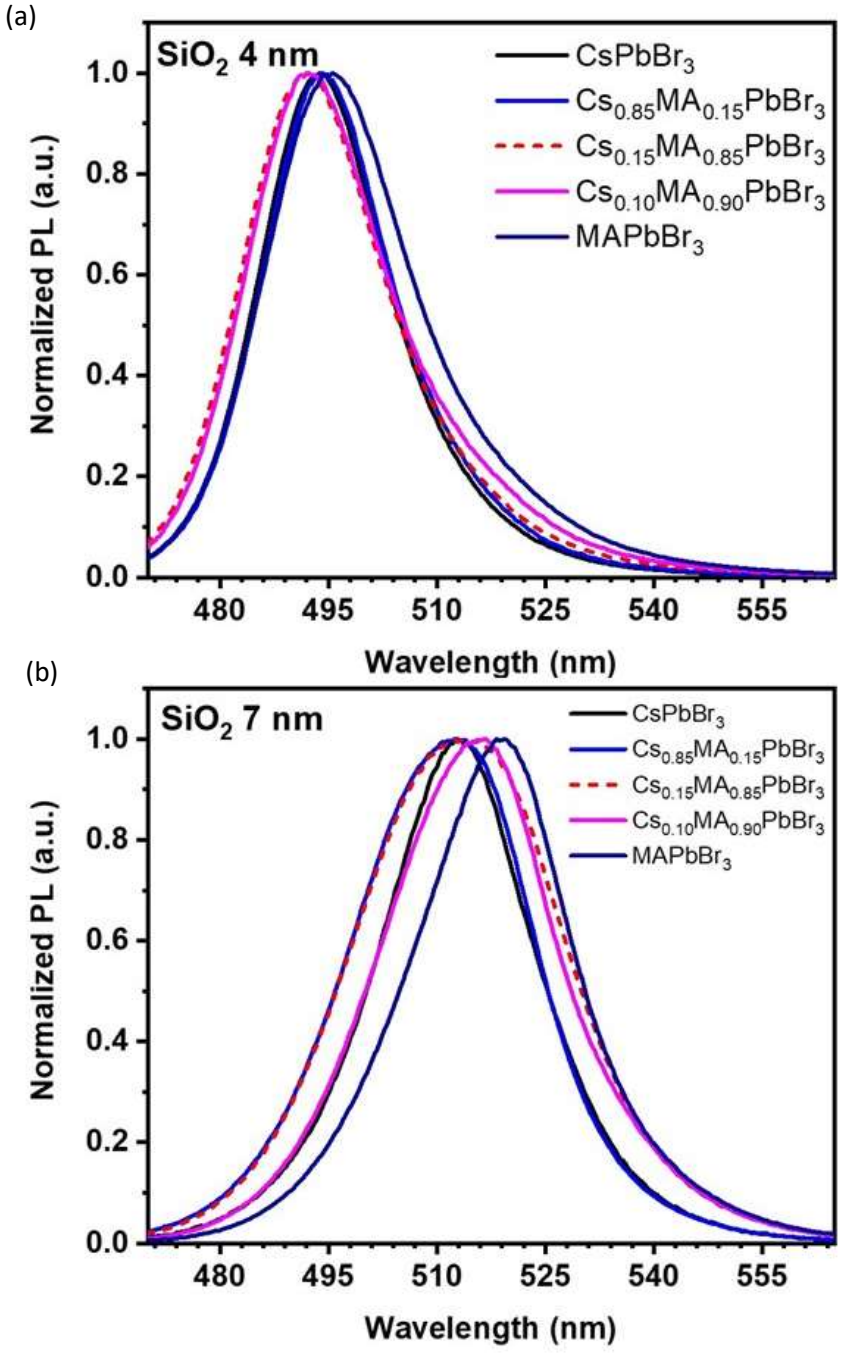
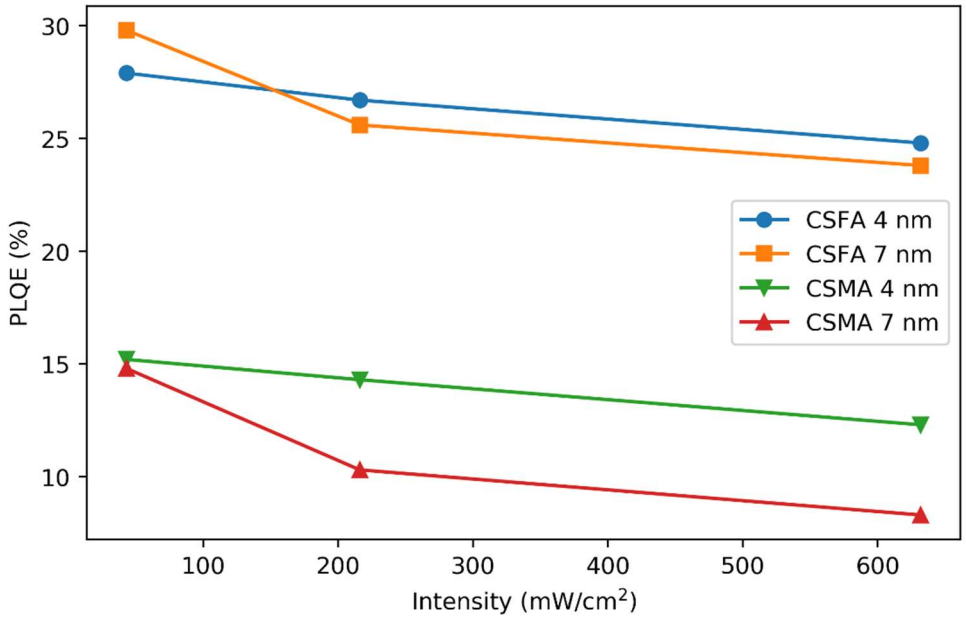


Supporting Figure S5. PL Spectra for $Cs_xMA_{x-1}PbBr_3$ formed within mesoporous silica templates of (a) 4 nm and (b) 7 nm average pore diameter.



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