

Electronic supplementary information

**Stable warm white light from UV-driven LEDs based on perovskite/silica composites with photoactivated luminescence enhancement**

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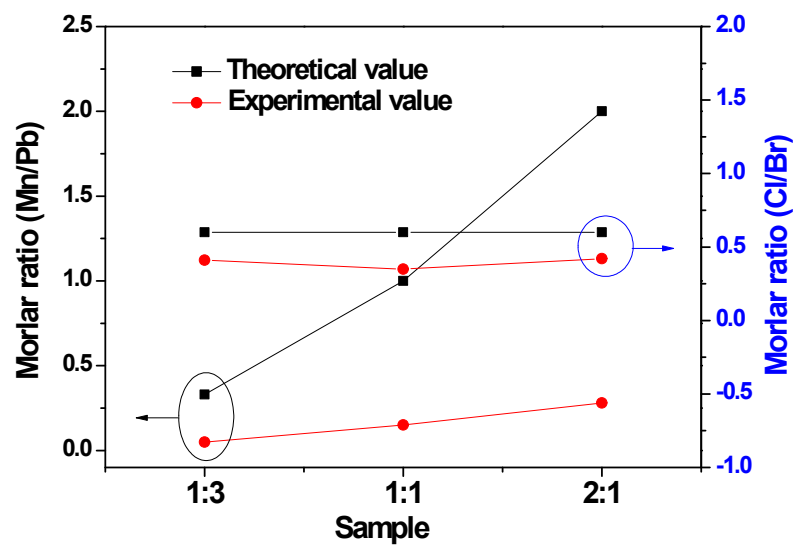
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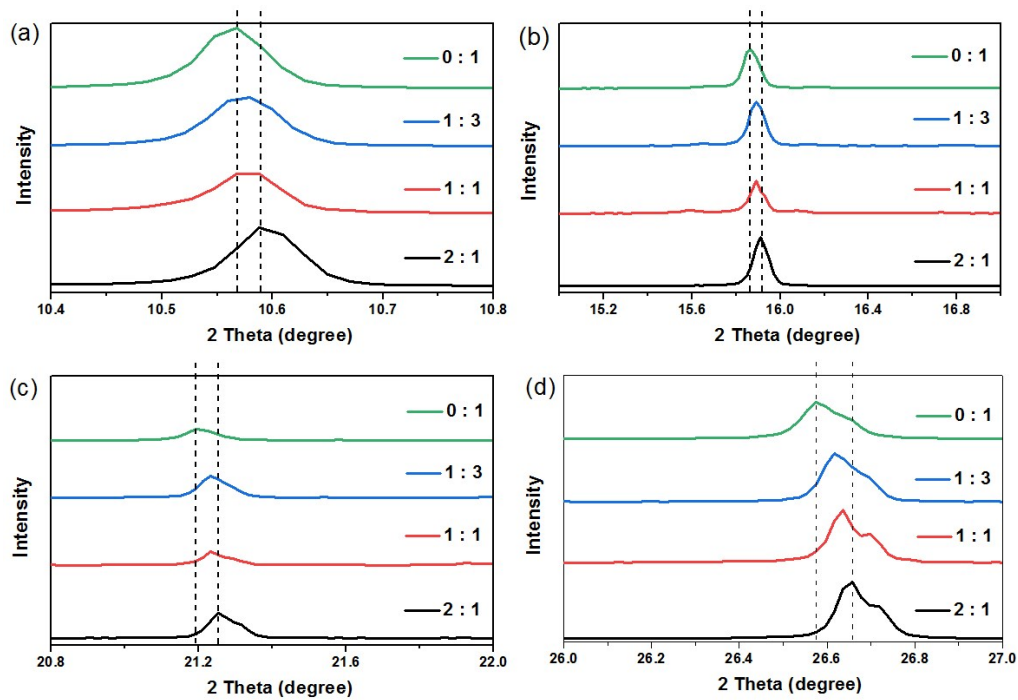
*‡ These authors contributed equally to the experimental work.*

**Table S1** Feeding amount of various ingredients of perovskite.

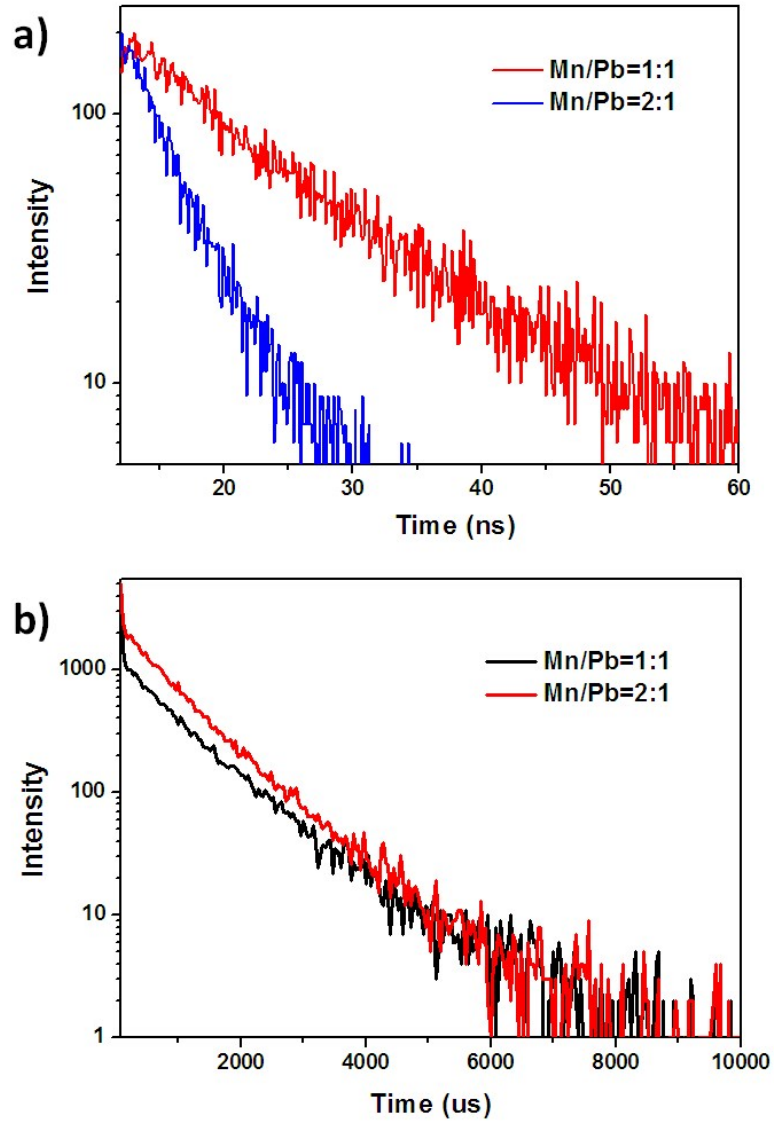
Entry	Molar ratio (Pb:Mn)	Molar ratio (Cl:Br)	PEACl	PEABr	MnBr <sub>2</sub>	PbBr <sub>2</sub>
1	1:2	1.5:2.5	0.3 mmol (47.26 mg)	0.1 mmol (20.20 mg)	0.4/3 mmol (28.67 mg)	0.2/3 mmol (24.70 mg)
2	1:1	1.5:2.5	0.3 mmol (47.26 mg)	0.1 mmol (20.20 mg)	0.2/2 mmol (21.50 mg)	0.2/2 mmol (36.70 mg)
3	3:1	1.5:2.5	0.3 mmol (47.26 mg)	0.1 mmol (20.20 mg)	0.2/4 mmol (10.76 mg)	0.2/4 mmol (55.06 mg)
4	1:0	1.5:2.5	0.3 mmol (47.26 mg)	0.1 mmol (20.20 mg)	0	0.2 mmol (73.4 mg)
5	1:1	1:3	0.2 mmol (31.50 mg)	0.2 mmol (40.40 mg)	0.2/2 mmol (21.50 mg)	0.2/2 mmol (36.70mg)
6	1:1	2:2	0.4 mmol (63.0 mg)	0	0.2/2 mmol (21.50 mg)	0.2/2 mmol (36.70 mg)



**Fig. S1** Ratio of Mn/Pb and Cl/Br in the perovskites composite film measured by EDS.



**Fig. S2** Partial enlarged XRD curves of perovskite powders with different ratio of Mn/Pb.



**Fig. S3** Photoluminescent decay profiles of composite films with different Mn/Pb ratio monitored at 400 nm (a) and 610 nm (b).

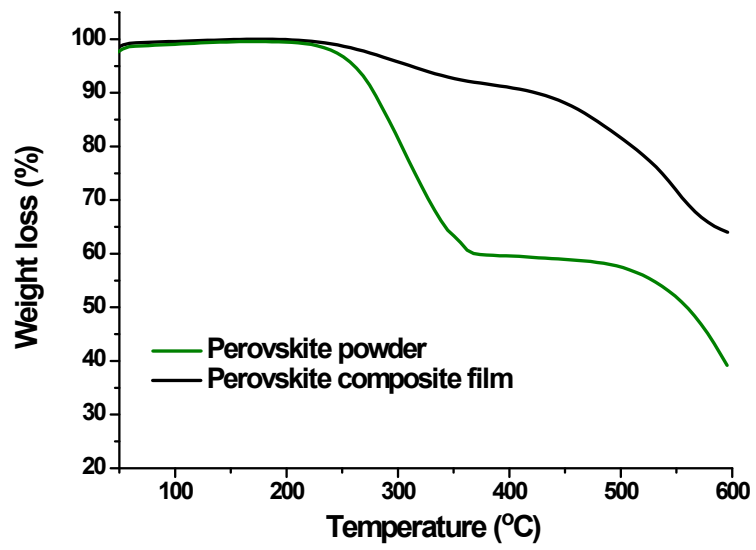
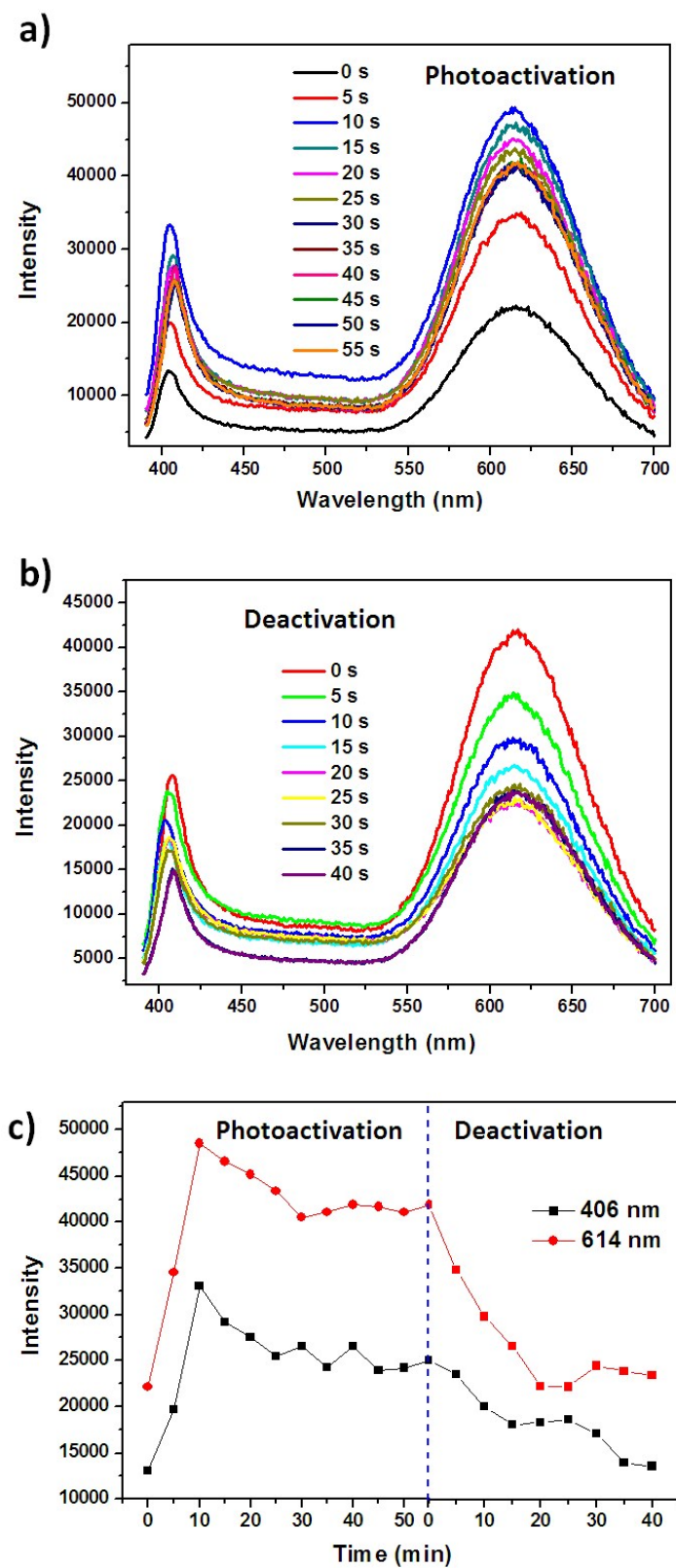
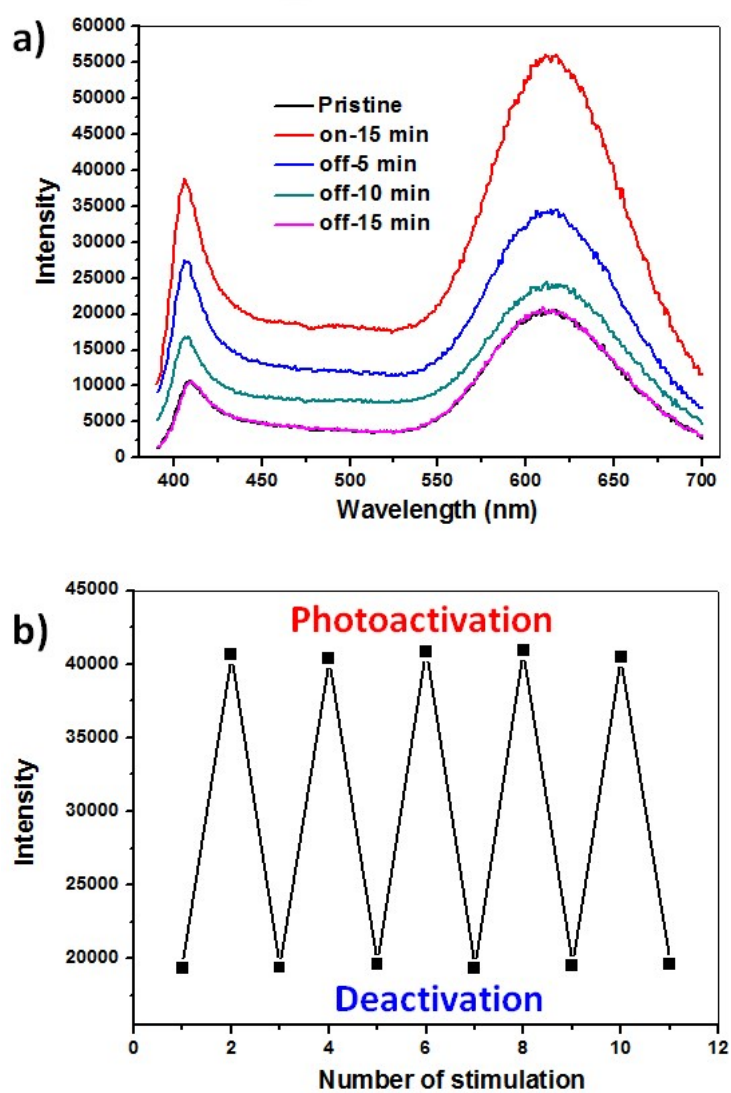


Fig. S4 TGA curve of perovskite composite film with 1:1 of Mn/Pb.



**Fig. S5** Changes of photoluminescent spectra of composite film in the process of photoactivation (a) and deactivation (b). Changes of emissive intensity of composite film at 406 nm and 614 nm (c).

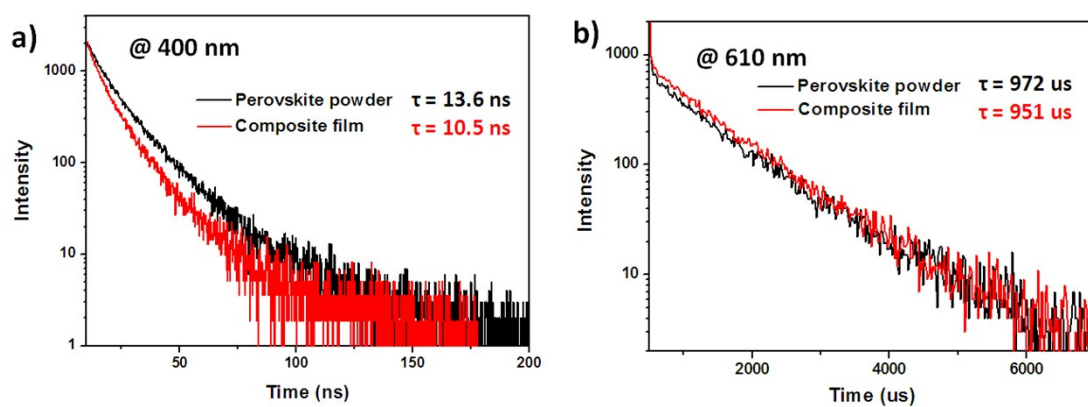


**Fig. S6** a) Changes of photoluminescent spectra of composite film in the process of deactivation (off) after 15 min of photoactivation (on-15 min). b) Changes of emissive intensity of film at 614 nm in the repeated photoactivation process.

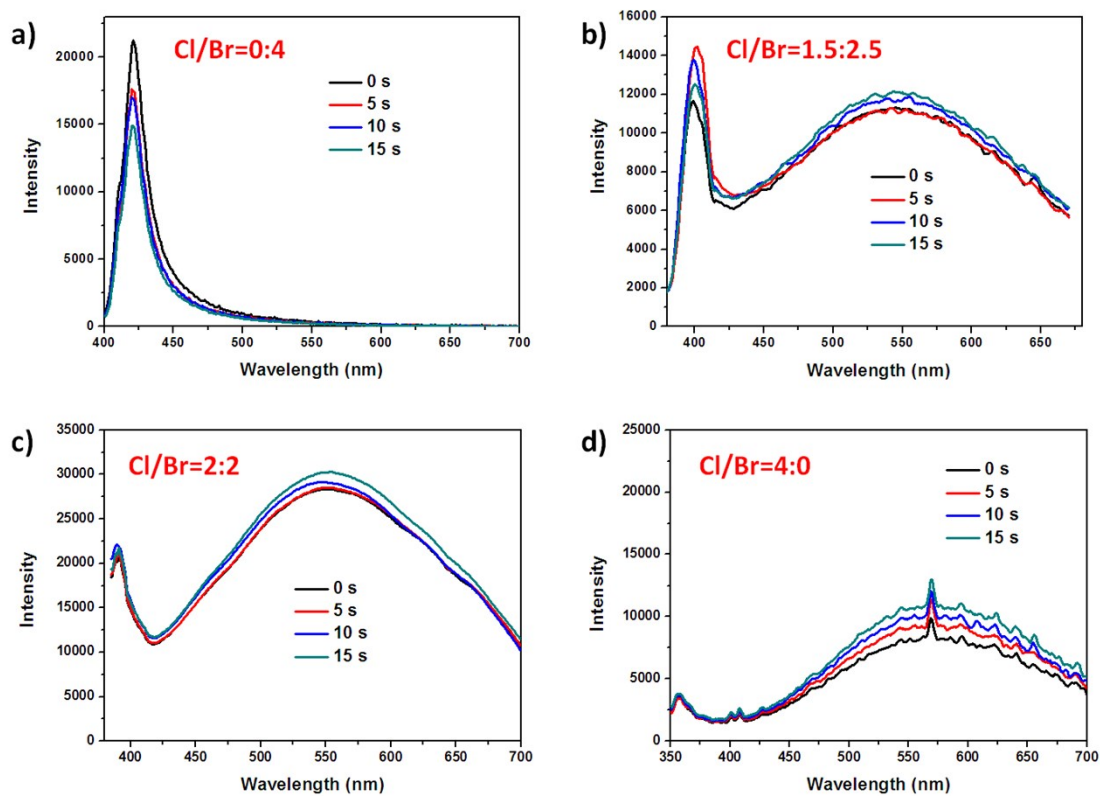


**Table S2** Lifetime of perovskite powder and composite film before and after photoactivation of 50 min.

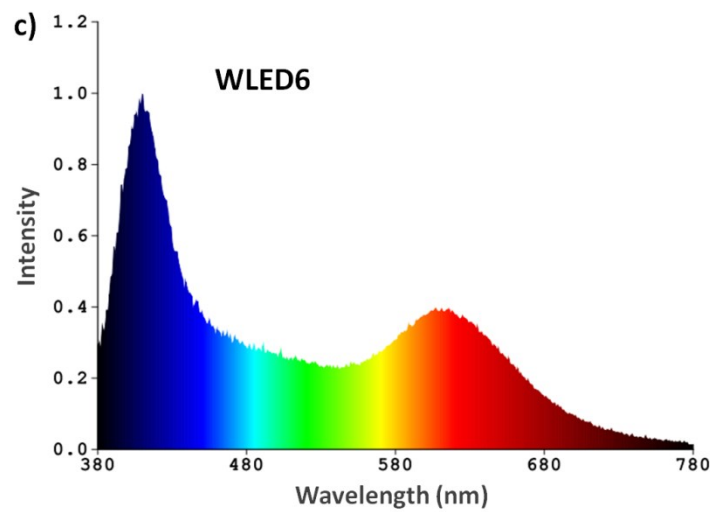
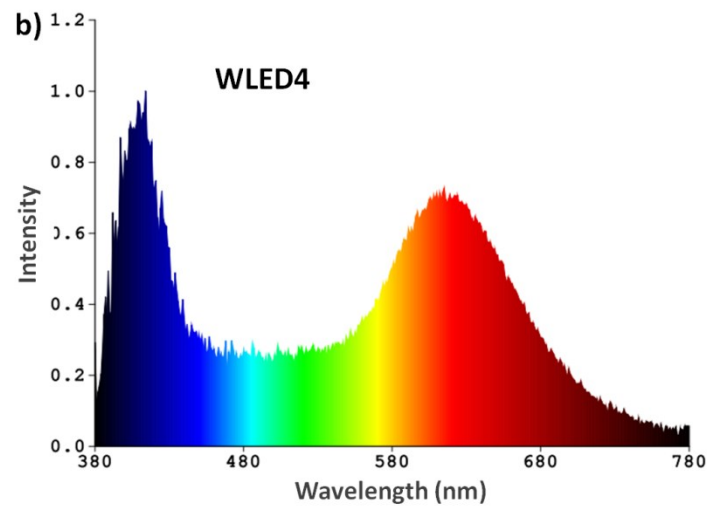
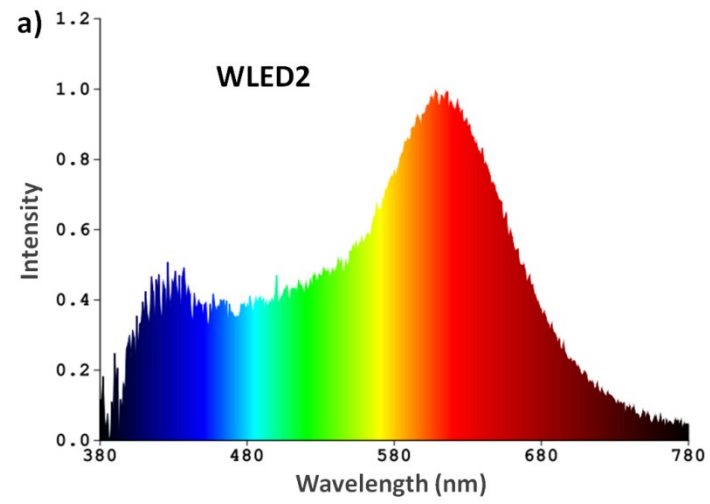
Sample	Before/After photoactivation	Lifetime	
		400 nm (ns)	610 nm (us)
Perovskite powders	Before	11.4	922
	After	13.59	972
Composite films	Before	3.96	872
	After	10.54	951



**Fig. S7** Photoluminescent decay profiles of photoactivated perovskite powder and composite film monitored at 400 nm (a) and 610 nm (b).



**Fig. S8** Changes of photoluminescent spectra of undoped perovskite powders with different Cl/Br ratio in 15 min of photoactivation.



**Fig. S9** Electroluminescence spectra of device WLED2 (a), WLED4 (b), and WLED6 (c).