

Sodium Doping for Enhanced Performance of Highly Efficient CsPbBr₃ quantum dots-Based Electroluminescence Light-Emitting Diodes

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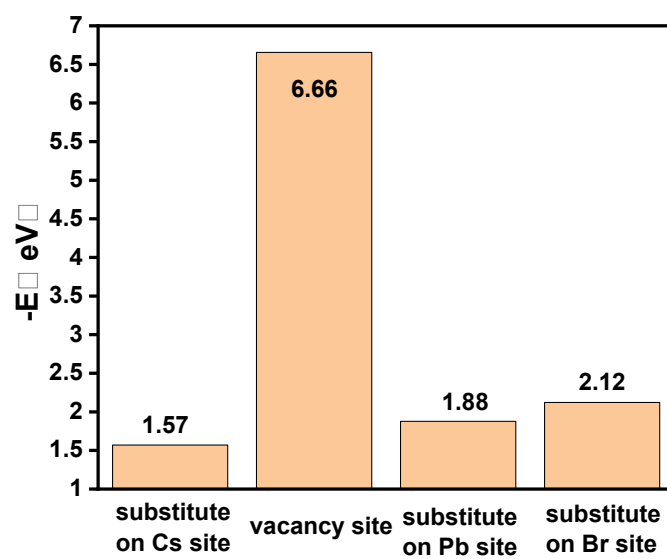


Figure S1. The formation energy for the sodium substitute on Cs site, vacancy site, Pb site and Br cite in the perovskite cubic structure.

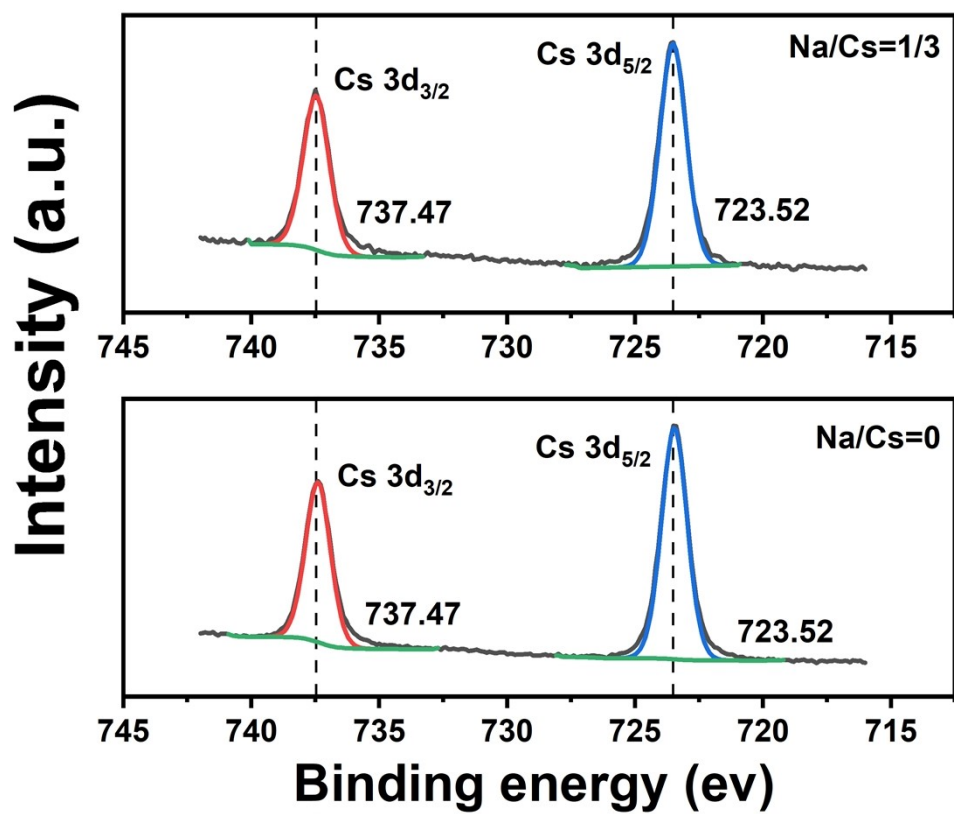


Figure S2. High-resolution XPS spectrum of Cs 3d_{3/2} and Cs 3d_{5/2} signal in Na⁺-doped and undoped CsPbBr₃ QDs.

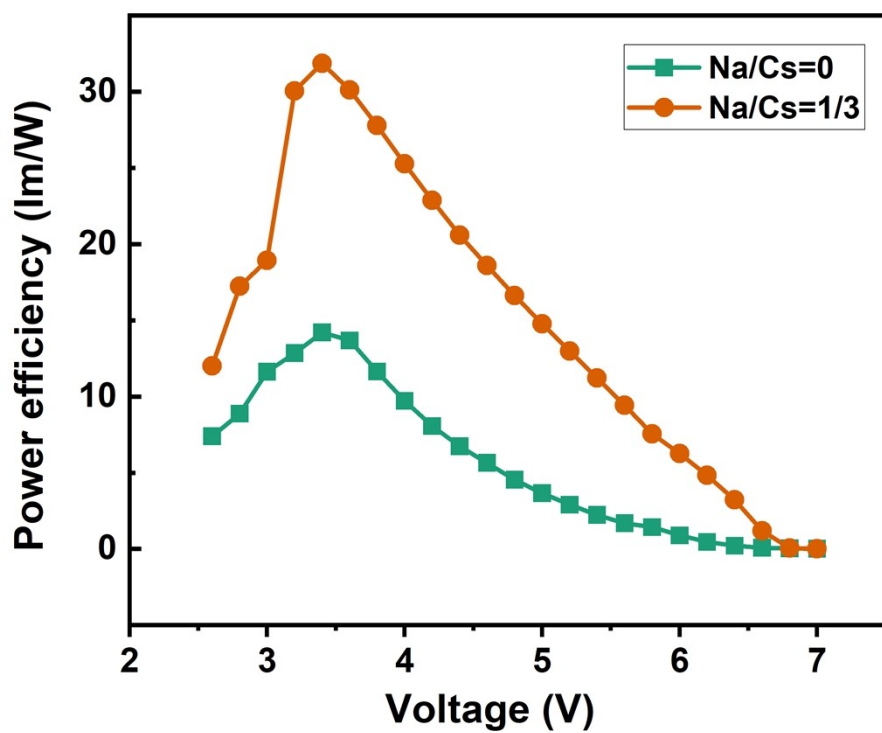


Figure S3. Power efficiency -voltage of the QLED device with undoped and Na⁺-doped CsPbBr₃ QDs as an emitting layer.

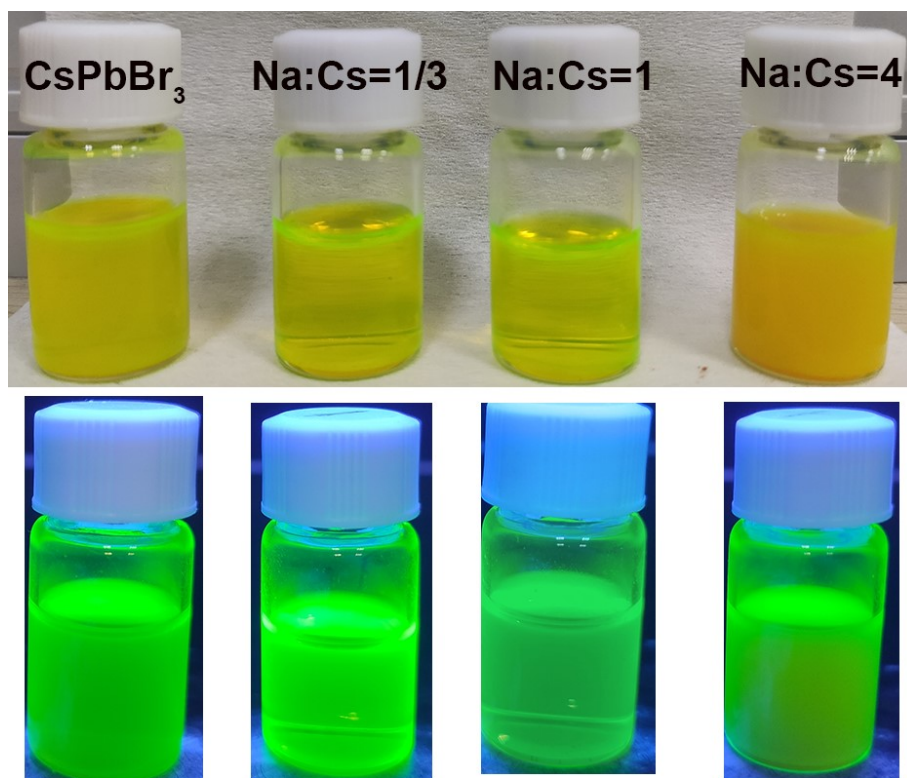


Figure S4. Pictures of CsPbBr_3 QDs and Na: CsPbBr_3 QDs under room light and 365 nm ultraviolet light.

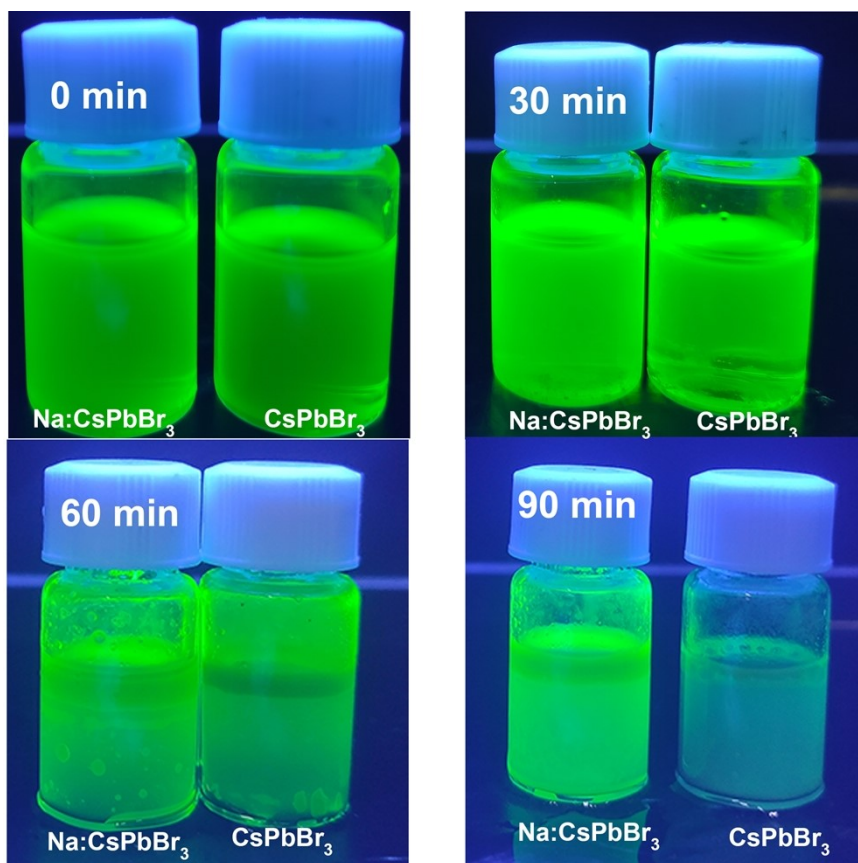


Figure S5. The photographs of CsPbBr₃ QDs and Na: CsPbBr₃ QDs in water and hexane mixture solution under 365 nm ultraviolet light.

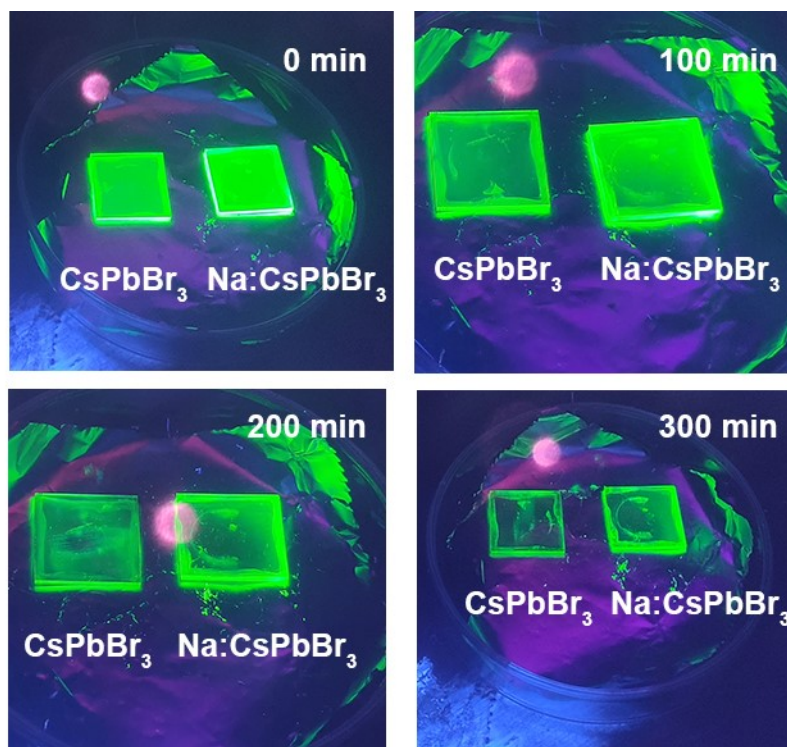


Figure S6. The photographs of the CsPbBr₃ QDs and Na: CsPbBr₃ QDs films under 365 nm ultraviolet light, the pictures were taken every 100 min.

Table S1. Summary of EL performance of Na⁺-doped and undoped CsPbBr₃ QLED devices

Na/Cs	V _t (V)	Current efficiency (cd A ⁻¹)	Power efficiency (lm W ⁻¹)	Luminance (cd m ⁻²)	EQE (%)
0	2.6	15.67	14.21	3431	4.73
1/3	2.5	34.51	31.84	20190	8.97

Table S2. Summary of the performances of QLEDs based on CsPbBr₃ perovskite QDs.

Year	EL peak (nm)	Max. EQE (%)	Max. L (cd/m ²)	Refs.
2015	516	0.12	946	[1]
2016	516	0.06	1377	[2]
2016	523	0.19	2335	[3]
2017	525	0.43	8911	[4]
2017	513	2.1	11990	[5]
2017	512	8.73	1660	[6]
2018	516	6.5	7085	[7]
2018	518	4.62	10206	[8]
2018	508	8.08	1000	[9]
2019	517	9.7	2270	[10]
2020	519	0.55	2011	[11]
2020	513	5.9	24458	[12]
2020	524	5.6	5760	[13]
2021	518	~	833	[14]
2021	516	6.05	32747	[15]
2021	517	4.81	92279	[16]
2021	525	8.97	20190	Our work

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