Electronic Supplementary Material (ESI) for RSC Advances.
This journal is © The Royal Society of Chemistry 2021

Electronic Supplementary Information

Research on the influence of polar solvents on $CsPbBr_3$ Perovskite QDs

Yifang Sun,[a, b] Huidan Zhang,[a, b] Kai Zhu,[c] Weiguang, Ye,[a] Lushuang She,[a, b] Ximing Gao,[a, b] Wenyu Ji,[c] Qinghui Zeng,*[a]

[a] State Key Laboratory of Luminescence and Applications, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Dong_Nanhu Road 3888, Changchun 130033, P. R. China

E-mail: qhzeng@ciomp.ac.cn

[b] University of Chinese Academy of Sciences, Beijing 100049, P. R.China

[c] Innovation Practice Center, Changchun University of Chinese Medicine, Changchun 130017, P. R. China.

[d] Key Lab of Physics and Technology for Advanced Batteries (Ministry of Education), Department of Physics, Jilin University, Changchun 130033, P. R. China

Starting materials

Cesium carbonate (99.9%), oleic acid (≥99%), 1-octadecene (90%), oleylamine (≥98%), lead bromide (99.999%) were purchased from Sigma-Aldrich. ethyl acetate (≥99.9%), n-Butyl acetate (≥99%), dibutyl phthalate (≥99%) were purchased from Aladdin. Toluene (≥95%), hexane (≥95%), methanol (≥99.5%), ethanol (≥99.7%), isopropanol (≥99.7%), 1-butanol (≥99%), 1-pentanol (≥95%), 1-octanol (≥99%), N,N-dimethylformamide (≥99.5%), acetone (≥99.5%), and tetramethylethylenediamine (≥99%) were purchased from Beijing Chemical Works. All the reagents were used without further purification.

Experiment

Dissolved 50μl PQDs with a concentration of 21mg/ml in 6ml n-hexane solution and set it as sample A, the solution added 50 μl acetone additionally was set as sample B1, added ethyl acetate, n-Butyl acetate, dibutyl phthalate separately were set as B2-B4， added 50 μl TMEDA in sample A, were set as sample B5, successively, added 50 μl DMF, set as sample B6, added methanol, ethanol, isopropanol, 1-butanol, 1-pentanol, 1-octanol to the sample A solution, and set them as sample B7-B12 in turn. Shaked sample A and Bx(x=1-12) together evenly with a ball machine, and let them stand for 30 minutes finally.

Solvent	DMF	methanol	ethanol	acetone	isopropanol	1-butanol
Permittivity ($C^2/(N\cdot M^2)$)	36.7	32.5	24.3	20.7	18.3	17.1
	1-pentanol	1-octanol	Ethyl acetate	n-Butyl acetate	dibutyl phthalate	
	13.9	10.34	6.02	5.01	6.436	

Table 1. Permittivity of polar solvents

Sample	A	B7	B8	B9	B10	B11	B12
peak wavelength (nm)	517.6	521	519	518.8	518.4	518.6	517.2

Table 2. The peak wavelength of sample A and sample B7-B12.

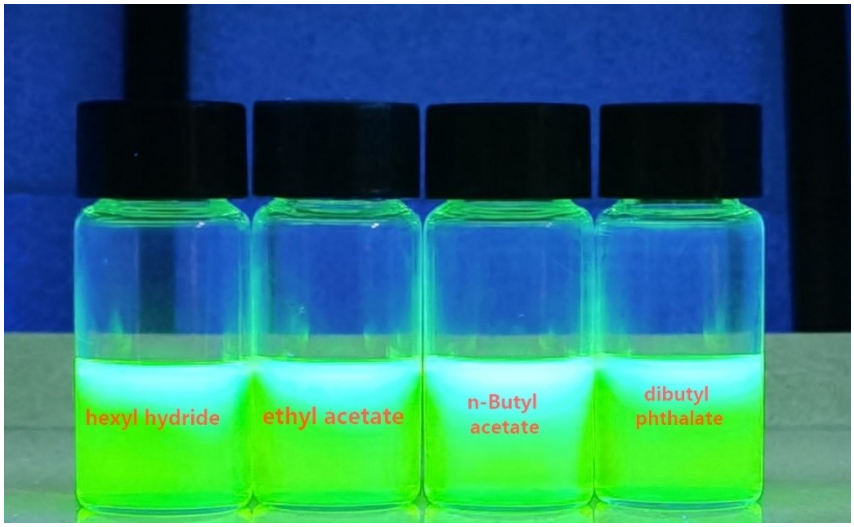

Figure S1. Photograph of the sample A and sample B2-B4 under UV light.

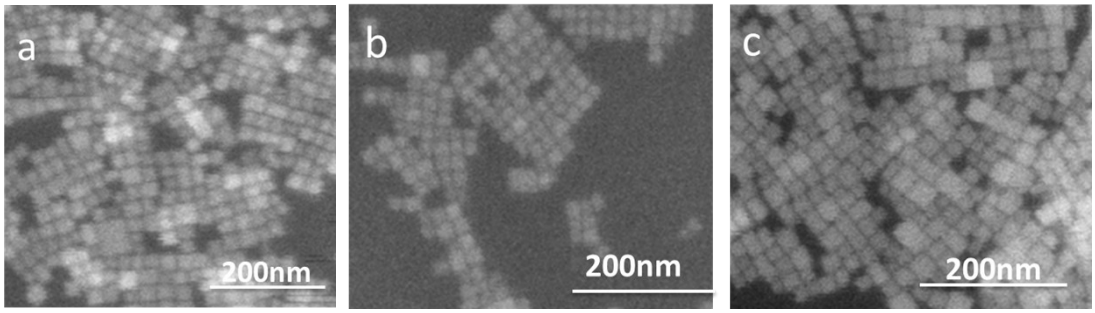

Figure S2. The FE-SEM images of PQDs after reacting with B2-B4.

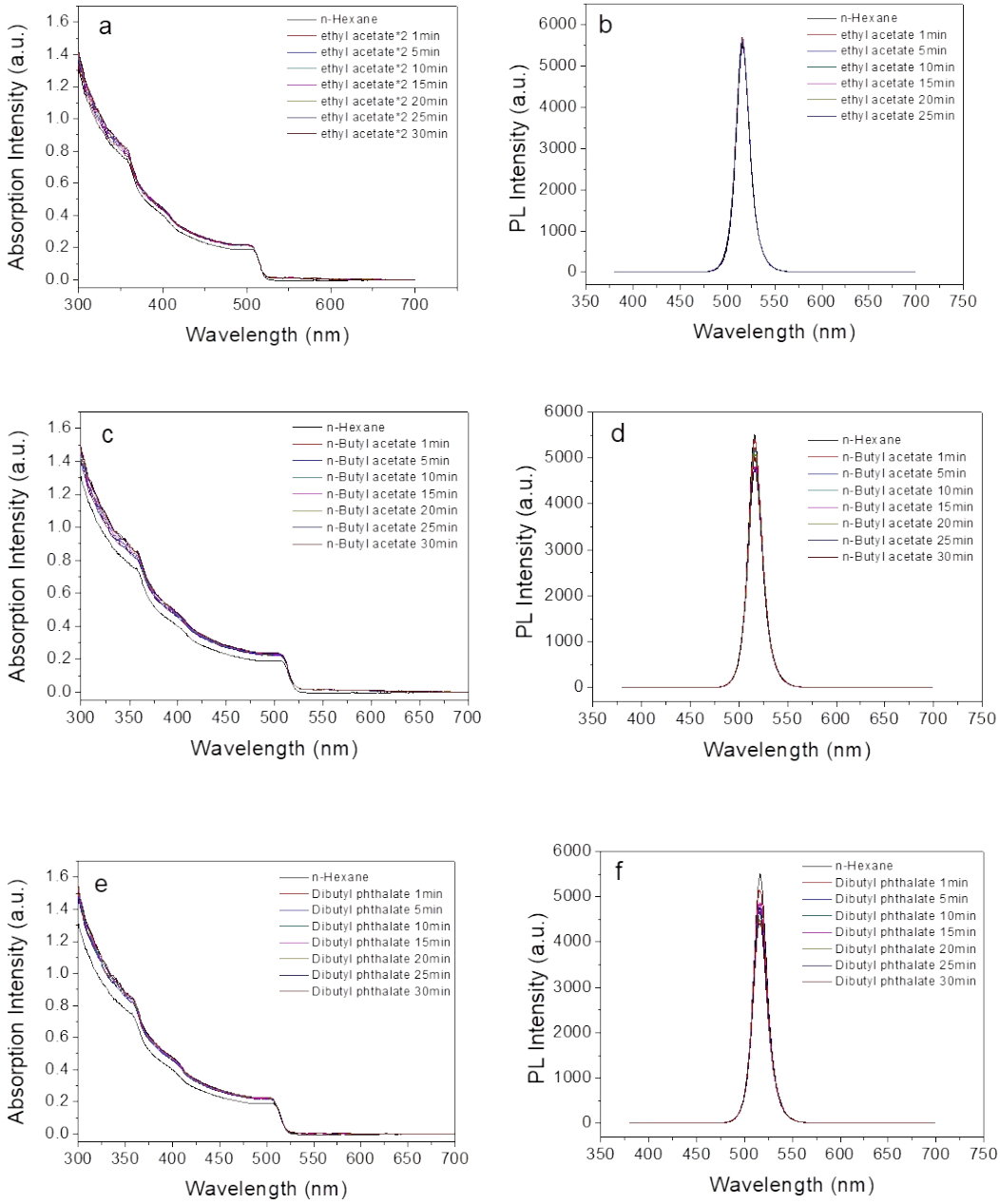

Figure S3. The absorption and PL spectras of sample B2-B4.

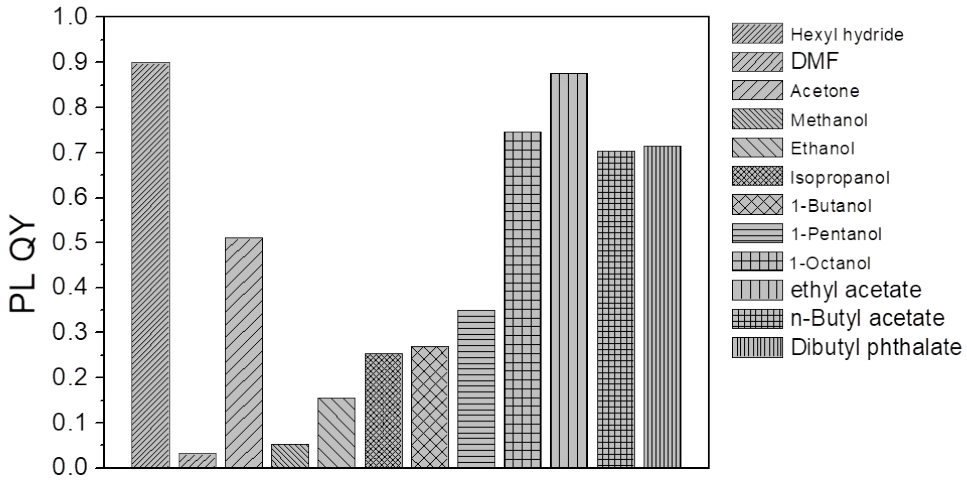

Figure S4. The PLQY of PQDs after adding hexyl hydride, DMF, acetone, methanol, ethanol, isopropanol, 1-butanol, 1-pentanol, octanol, ethyl acetate, n-Butyl acetate, dibutyl phthalate.

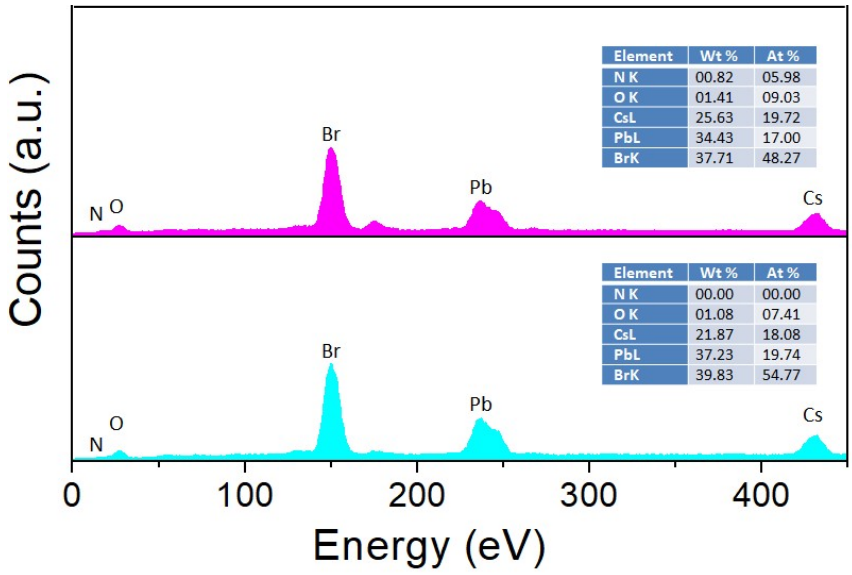

Figure S5. The EDS diagrams of hexyl hydride (blue) and TMEDA (pink).

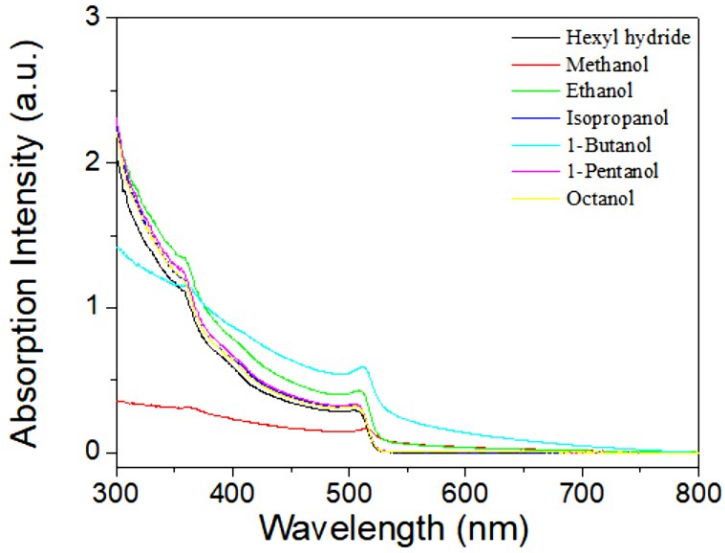

Figure S6. The absorption spectra of PQDs after reacting with alcohols.

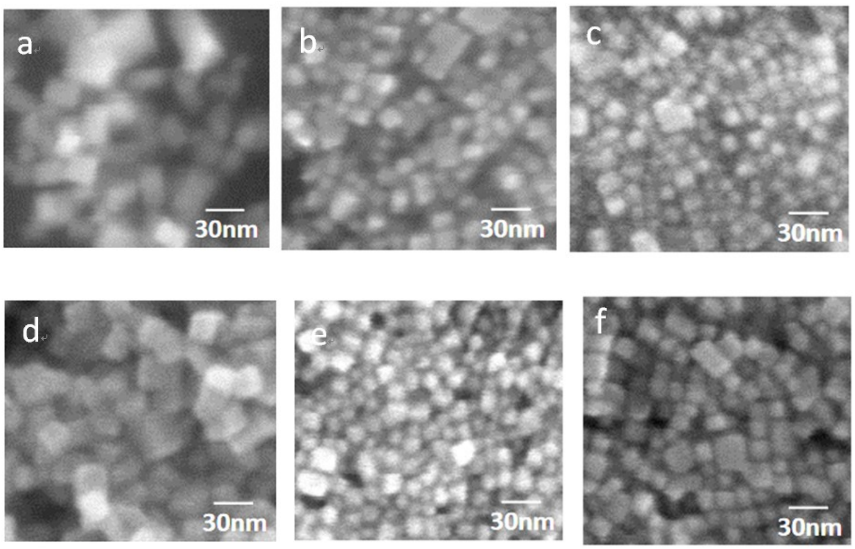

Figure S7. The FE-SEM images of PQDs after reacting with methanol, ethanol, isopropanol, 1-butanol, 1-pentanol, octanol.

Polor solvent	Structure	PLQY
Acetone	Shedding part of the ligand molecules	51%
Ethyl acetate	Shedding part of the ligand molecules	87.58%
n-Butyl acetate	Shedding part of the ligand molecules	70.34%
Dibutyl phthalate	Shedding part of the ligand molecules	71.48%
TMEDA	Partial replacement the ligand molecules	keep a strong fluorescence reaction after standing for one year.
DMF	Large amounts of ligand molecules fall off and aggregate	3.2%
Methanol	Large amounts of ligand molecules fall off and aggregate	5.32%
Ethanol	Shedding part of the ligand molecules	15.57%
Isopropanol	Shedding part of the ligand molecules	25.3%
1-Butanol	Shedding part of the ligand molecules	26.97%
1-Pentanol	Shedding part of the ligand molecules	34.96%
1-Octanol	Shedding part of the ligand molecules	74.66%

Table 3. After added different polar solvents, the changes of structural and optical properties of the PQDs.