



超分子结构与材料国家重点实验室

State Key Laboratory of Supramolecular Structure and Materials



International Workshop on Advanced Display Materials

Edge anchoring stabilizes perovskite quantum dots via **multi-amino ligands**

Qingsen Zeng

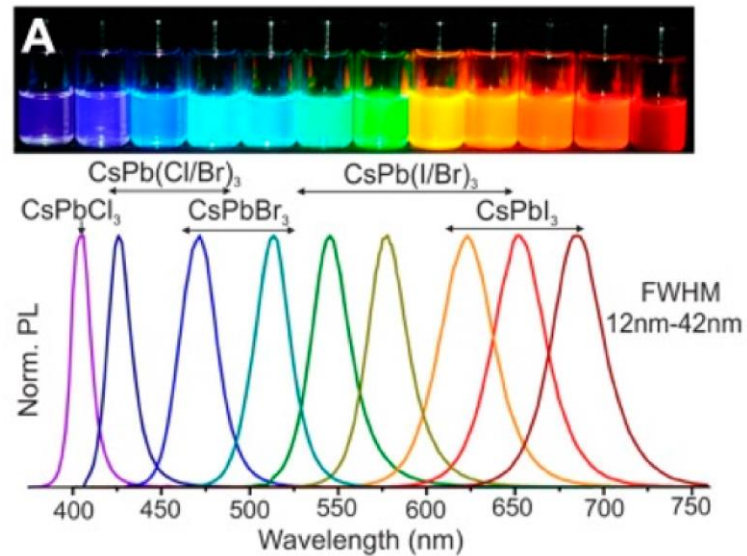
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Perovskite quantum dots (PQDs)

Advantages

- high PL QY
- narrow emission
- low defect density
- tunable emissive peaks
- easy-to-prepare

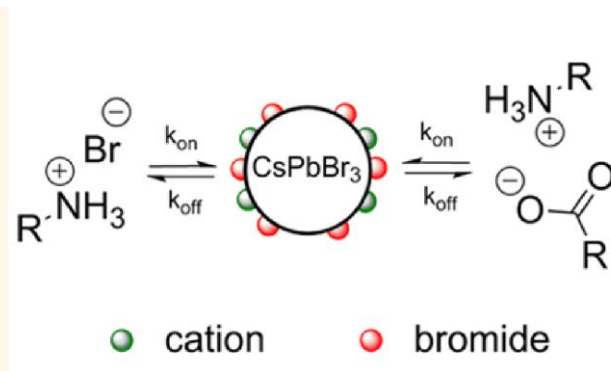


➤ Kovalenko* et al. *Nano Lett.* **2015**, 15, 3692

Challenge: stability

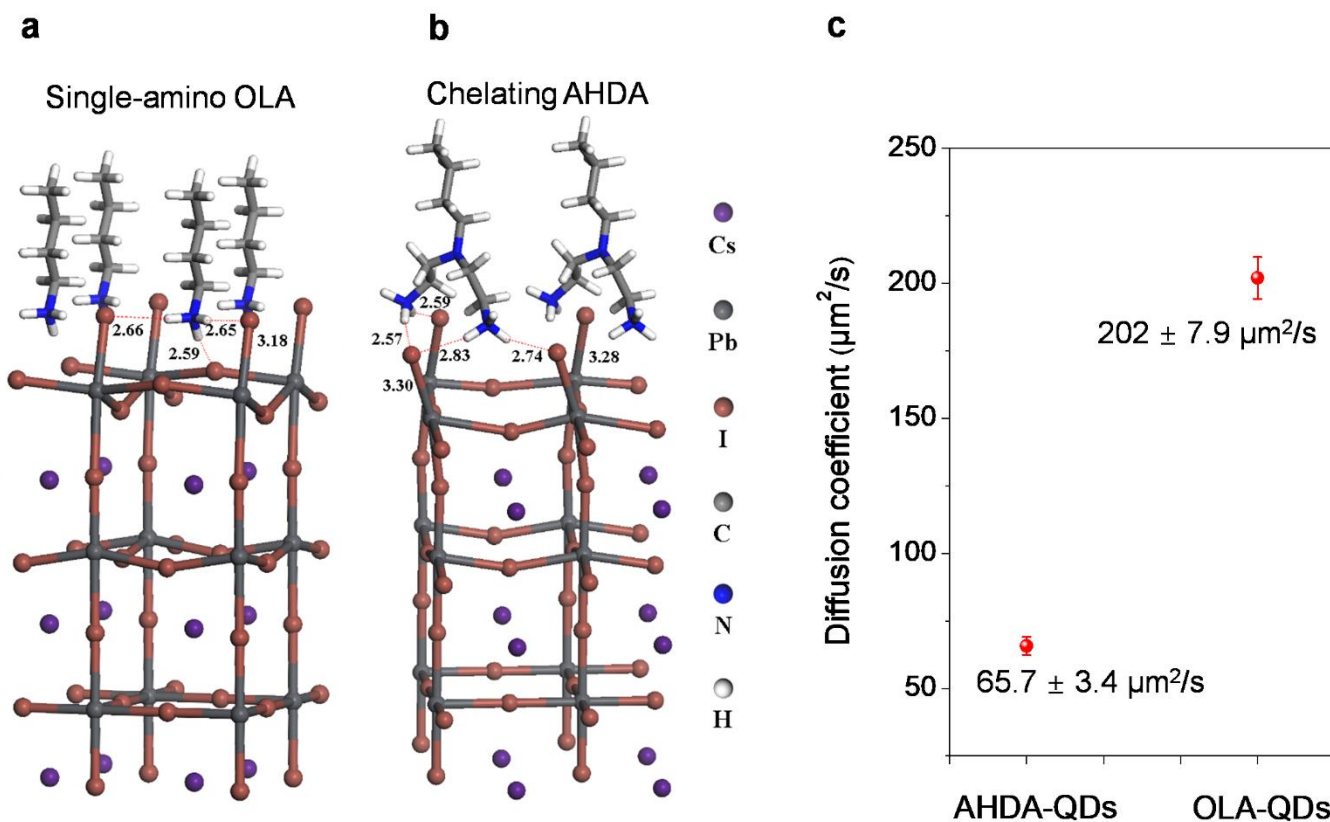
Origin:

- ionic crystal
- loose binding ligand



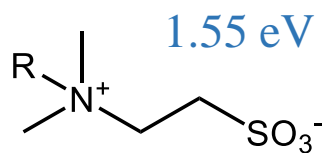
➤ Kovalenko*, Hens* et al. *ACS Nano* **2016**, 10, 2071

Edge anchoring via multi-amino ligands



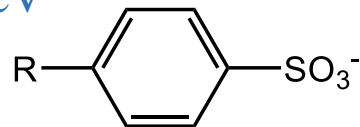
Binding energy: 1.47 eV

2.36 eV



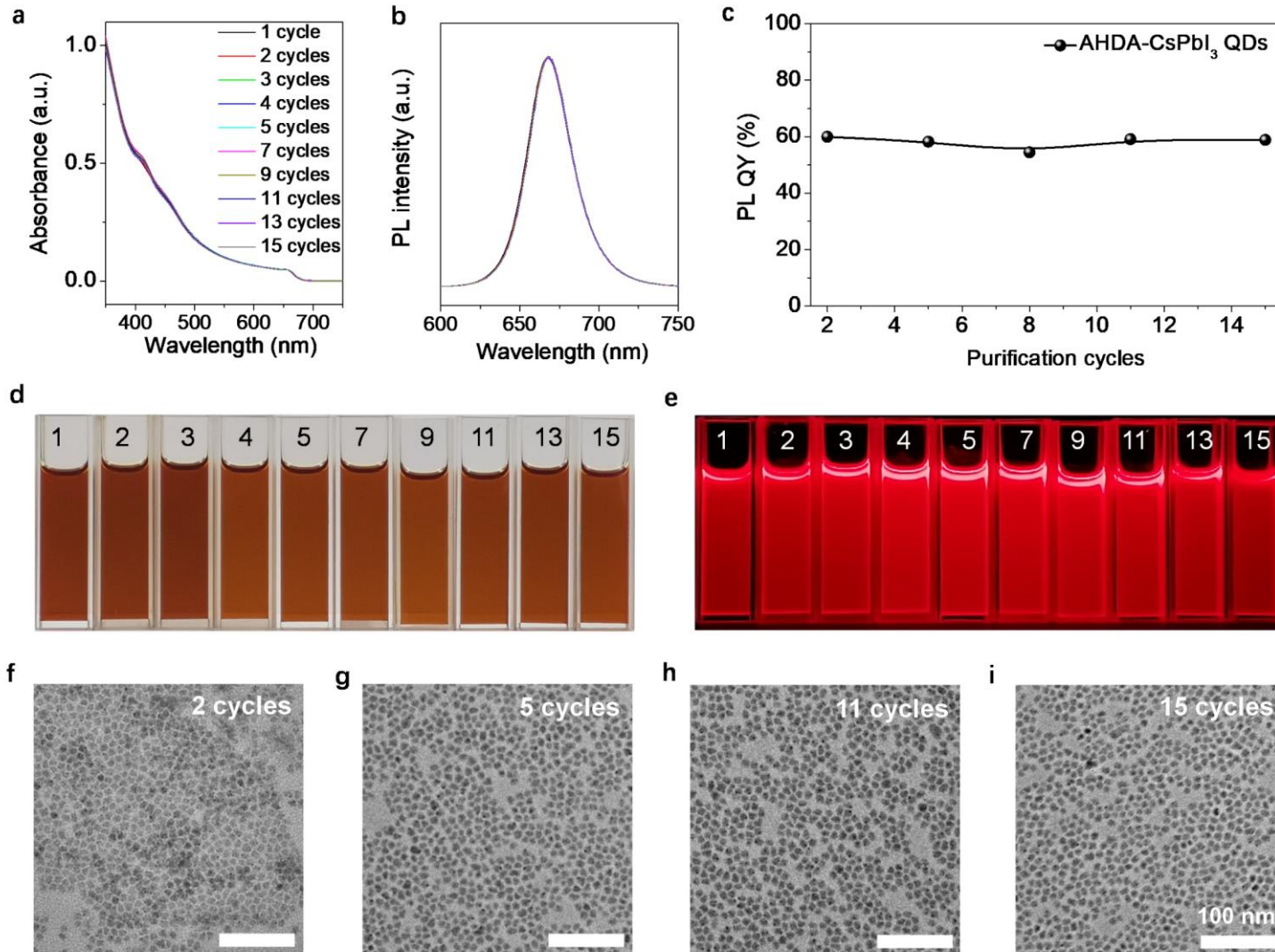
Kovalenko* ACS Energy Lett. **2018**, 3, 641

1.64 eV



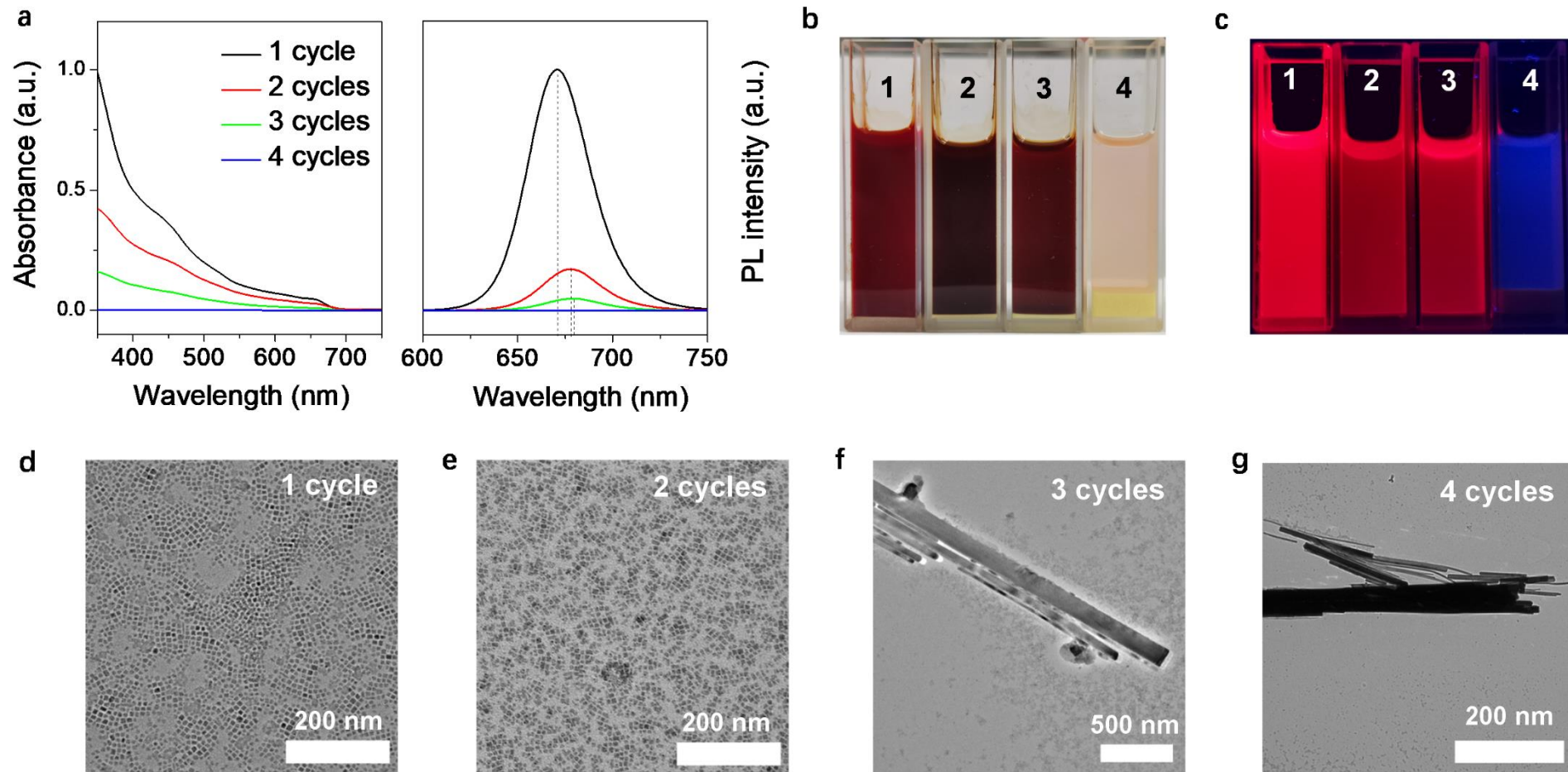
Haibo Zeng* Adv. Mater. **2019**, 1900767

AHDA-CsPbI₃ PQDs



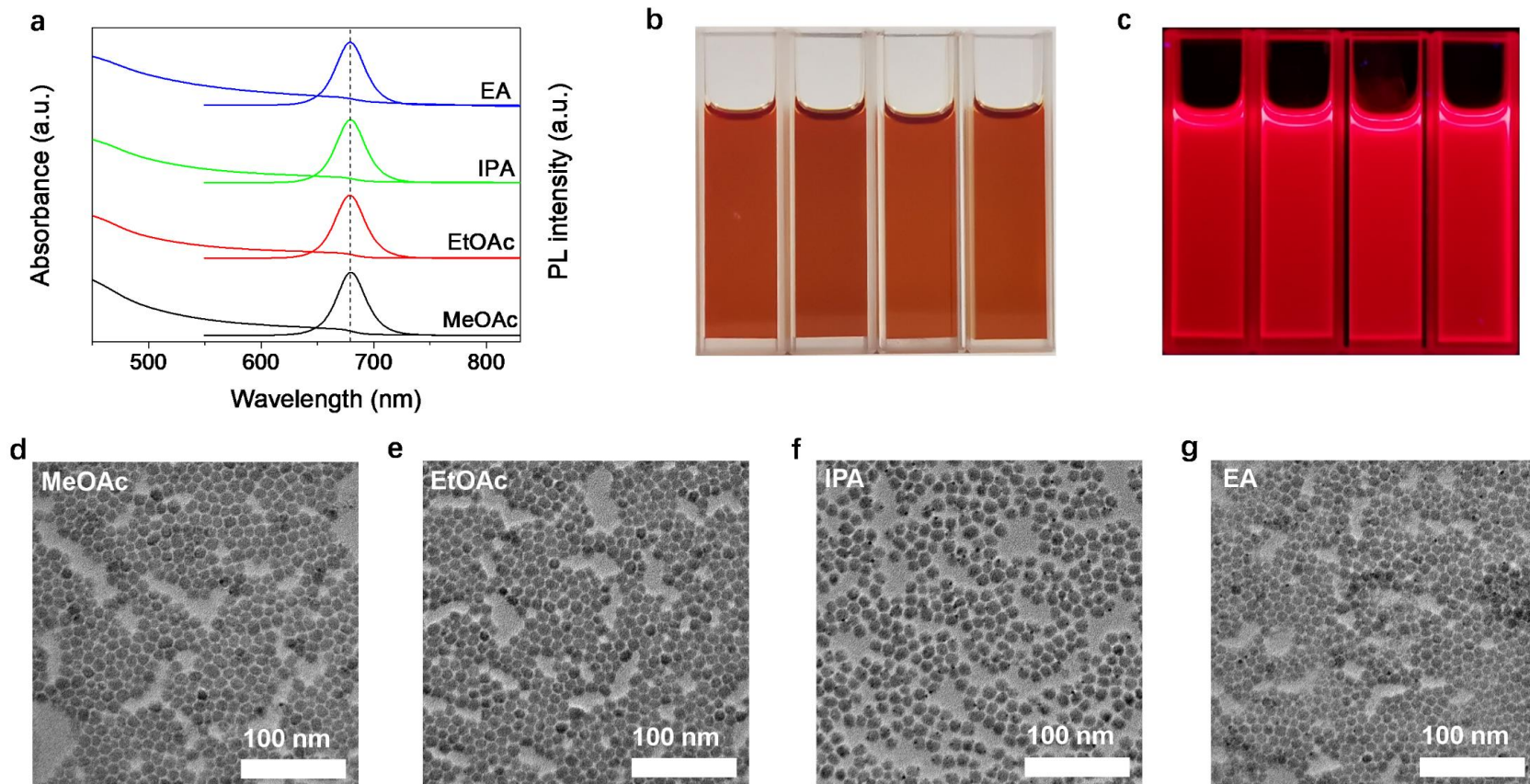
Optical properties and morphology can be maintained over 15 purification cycles

OLA-CsPbI₃ PQDs



Spectra and structures changed with purification cycles

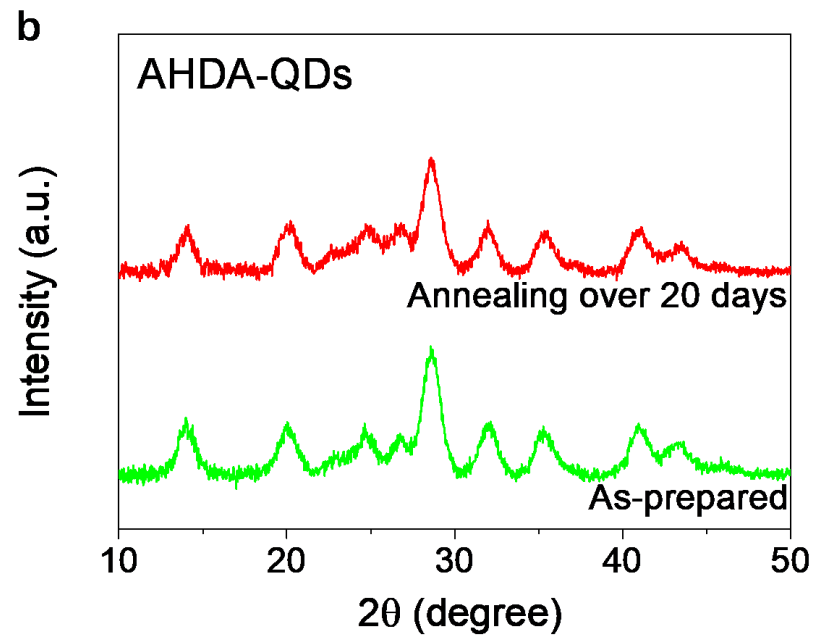
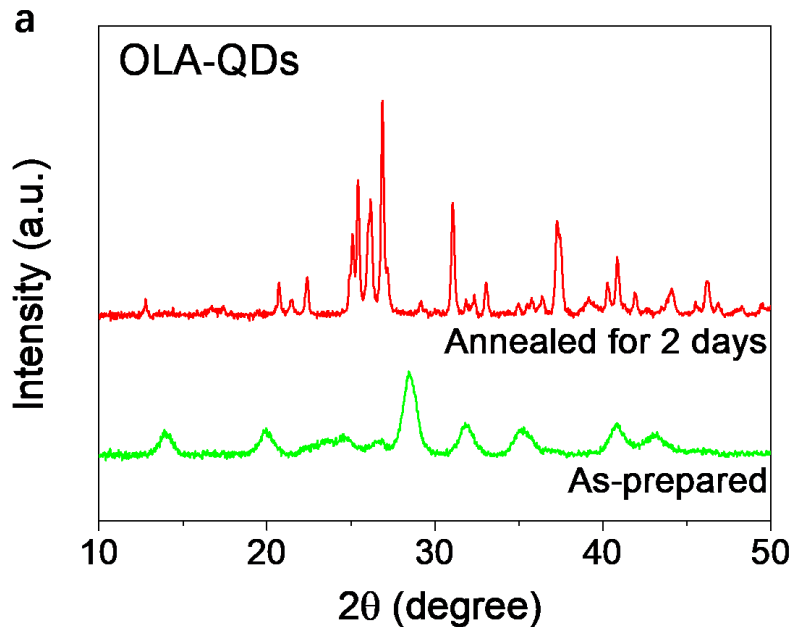
AHDA-CsPbI₃ PQDs in polar solvent



Optical properties and morphology can be maintained even in ethanol (EA)

Phase stability

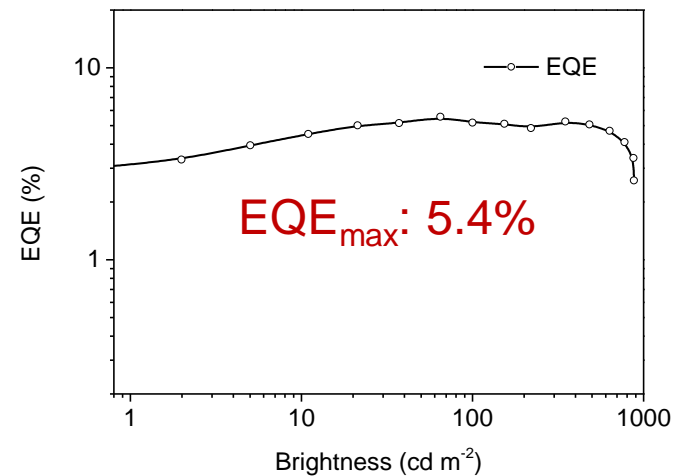
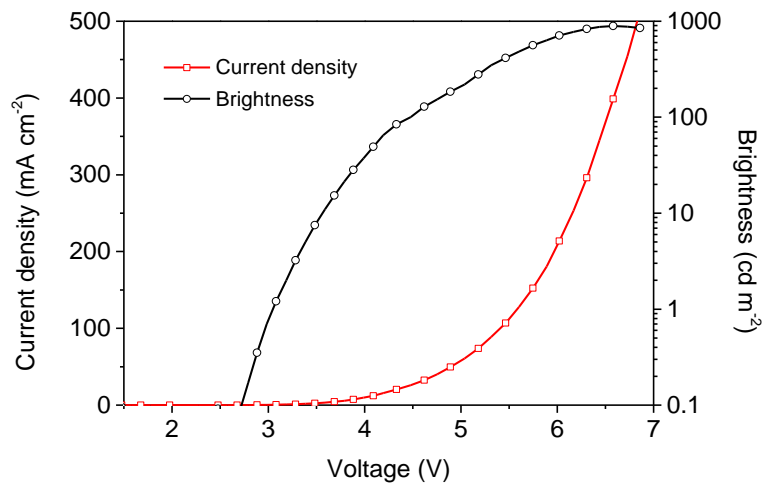
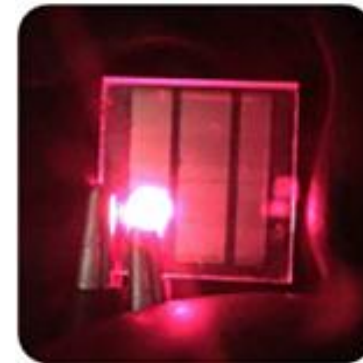
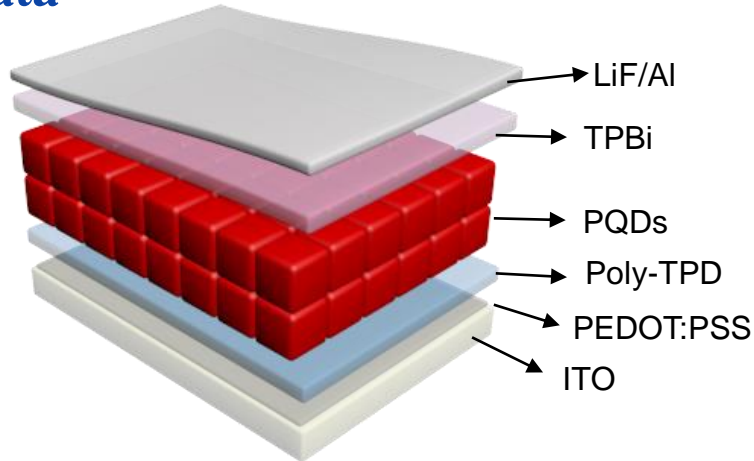
Annealed at 85°C in air with relative humidity of 30-40%



Phase stability of AHDA-stabilized CsPbI₃ PQDs maintained for > 20 days

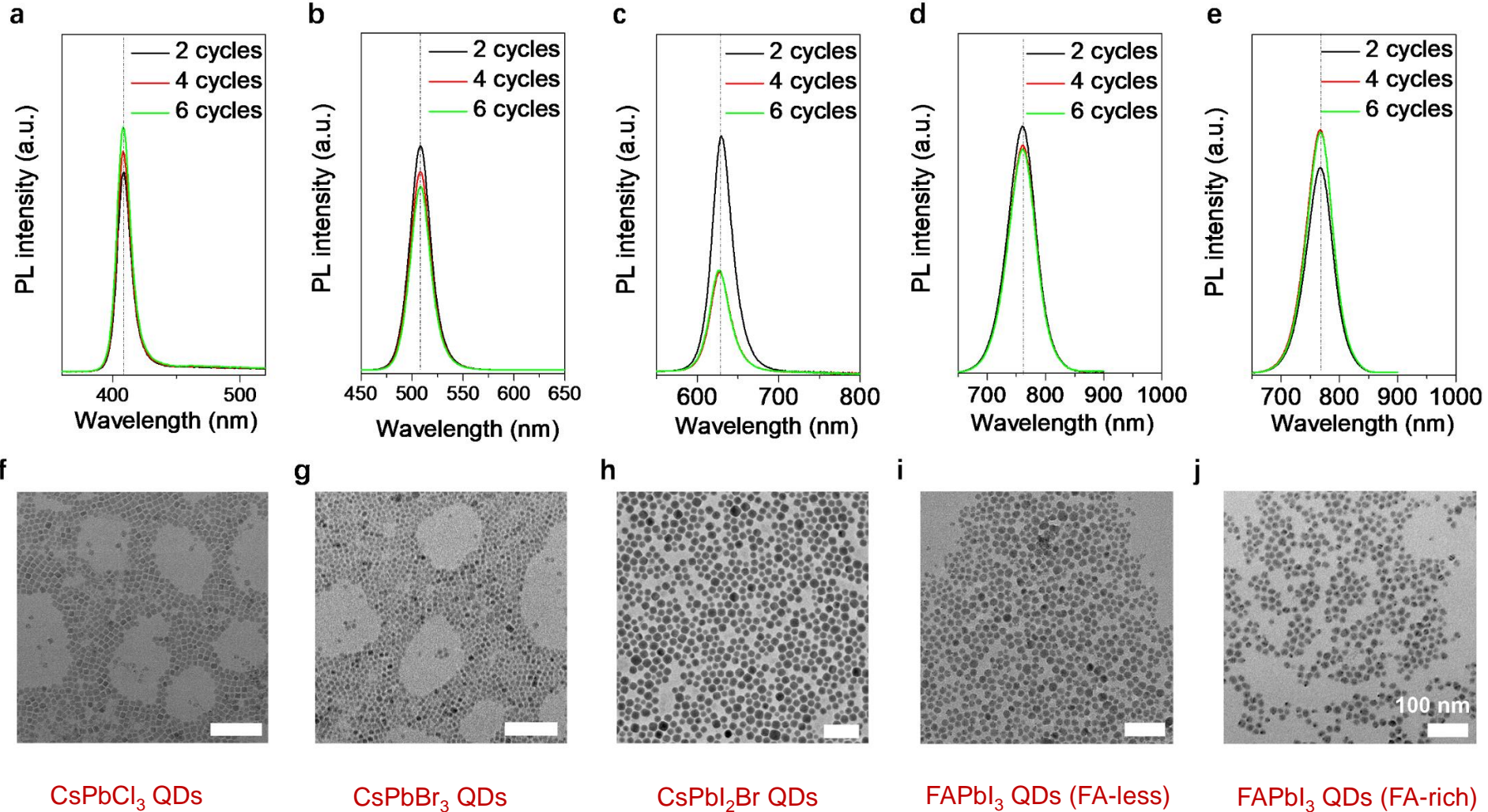
LEDs devices

Preliminary data



The performance is optimizing, and device stability and **ionic migration** are under evaluation

Universality of AHDA



Summary

- We developed a robust multi-amino ligand named AHDA, which allows to attach AHDA on PQD surface with high binding energy reaching 2.36 eV.
- AHDA can stabilize PQDs against purification, heat and polar solvent.

Acknowledgement

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Prof. Xiaoyu Zhang

Dr. Qiming Bing

