# Colloidal quantum dots on macroscale perovskite single crystal with perfect lattice matching

Yu-Hao Deng[1,2,3‡], Yun-Gang Sang[1,2,4‡], Xiao-Wei Zhang[1,2,5‡], Yi-Fei Mao[1,2,6], Ren-Min Ma[1,2*]

[1] *State Key Lab for Mesoscopic Physics and School of Physics, Peking University, 100871 Beijing, China*

[2] *Frontiers Science Center for Nano-optoelectronics & Collaborative Innovation Center of Quantum Matter, Peking University, 100871 Beijing, China*

[3] *Physics and Chemistry of Nanostructures Group, Ghent University, 9000 Ghent, Belgium*

[4] *Institute of Microelectronics, Chinese Academy of Sciences, 100029 Beijing, China*

[5] *Institute of Advanced Materials, Beijing Normal University, 100875 Beijing, China*

[6] *School of Sensing Science and Engineering, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China*

‡ These authors contributed equally to this work

* Correspondence should be addressed to renminma@pku.edu.cn

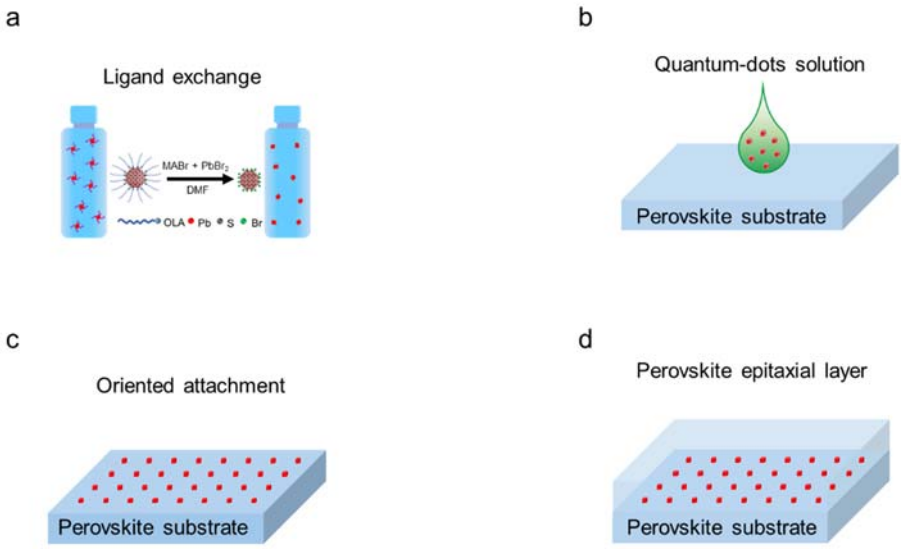


**Fig. S1. Synthesis process of the quantum-dot/perovskite heterocrystals. (a)** The quantum dots with organic ligands were synthesized by colloidal method. Then the ligand organic-ligand molecules on the surface of quantum dots were exchanged by bromine ions. **(b)** Solution was dispensed on the perovskite substrate. **(c)** Quantum dots oriented attachment onto perovskite substrate, which along the same orientation direction between quantum dots and perovskite substrate. **(d)** Finally, perovskite epitaxial layer was formed by putting the quantum-dot/perovskite heterocrystals semiconductor into perovskite precursor solution under 80 ºC.

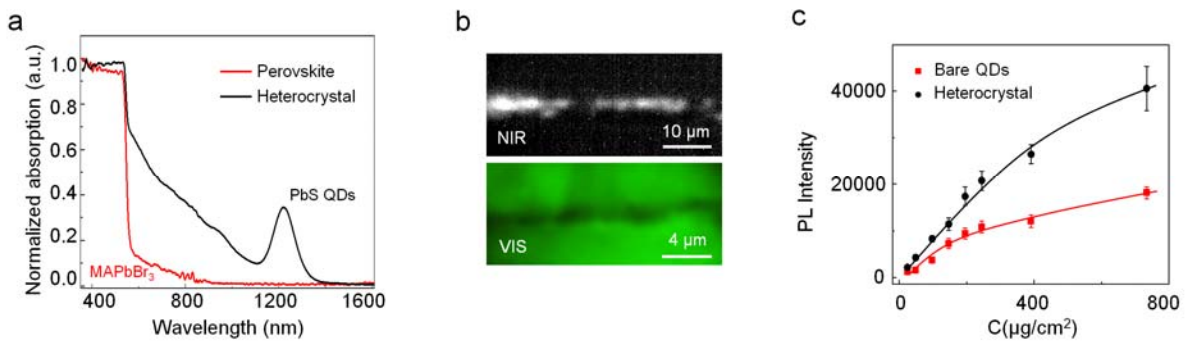


**Fig.S2 |** (**a**) Absorption spectra of Perovskite and PbS quantum-dot/perovskite heterocrystals. (**b**) Photoluminescence imaging of the PbS quantum-dot/perovskite heterocrystals collected with a near infrared (top) and visible (bottom) camera. (**c**) Photoluminescence intensity of bare quantum dots and quantum-dot/perovskite heterocrystals under different quantum dots concentrations.