Electronic Supplementary Information

Solution-Processed $Zn_xCd_{1-x}S$ Electron Transport Layer for High-Performance Inverted Quantum Dot Light-Emitting Diodes

Yuanlin Huang, Chen Lin, Mengxin Liu*, Xinan Shi * and Daocheng Pan*

State Key Laboratory of Featured Metal Materials and Life-cycle Safety for Composite Structures; Guangxi Key Laboratory of Processing for Non-ferrous Metals and Featured Materials; Guangxi Key Laboratory of Advanced Rare Earth Materials; School of Resources, Environment and Materials, Guangxi University, Nanning 530004, China

*E-mail: mxliu@st.gxu.edu.cn; xashi@gxu.edu.cn and dcpan@gxu.edu.cn

Table S1 Device parameters of QLED devices with different ETLs.

ETL	**V_{on} (V)**	**L_{max} (cd m^{-2})**	**EQE (%)**	**Reference**
ZnO	2.4	68811	20.7	1
ZnMgO	2.3	200000	22.3	2
SnO_2	2.5	60833	18.9	3
TiO_2	3.0	106789	12.0	4
CdS	3.0	90250	10.9	This work
$Zn_{0.1}Cd_{0.9}S$	3.0	103910	16.0	This work

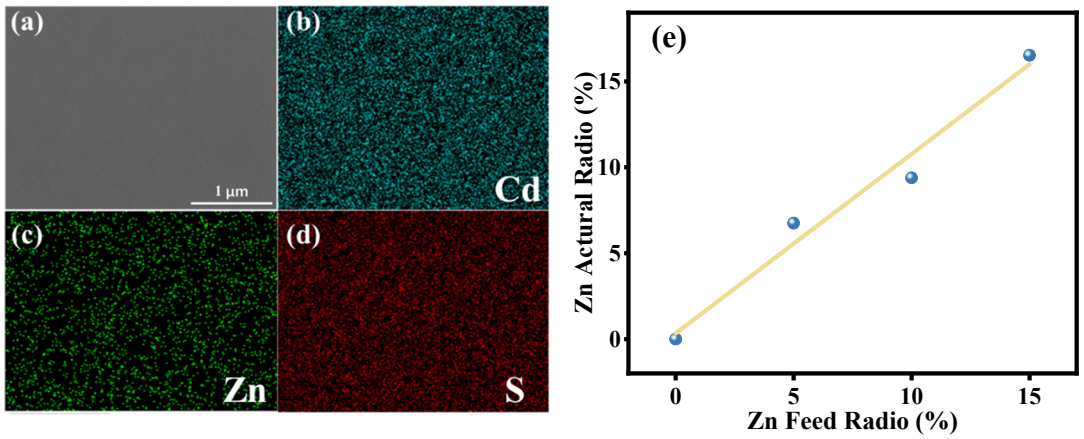

Fig. S1 (a) SEM surface morphology and (b-d) elemental mappings of $Zn_{0.1}Cd_{0.9}S$ thin film. (e) Relationship between actual Zn^{2+} doping ratios and Zn^{2+} feeding ratios in $Zn_xCd_{1-x}S$ thin films.

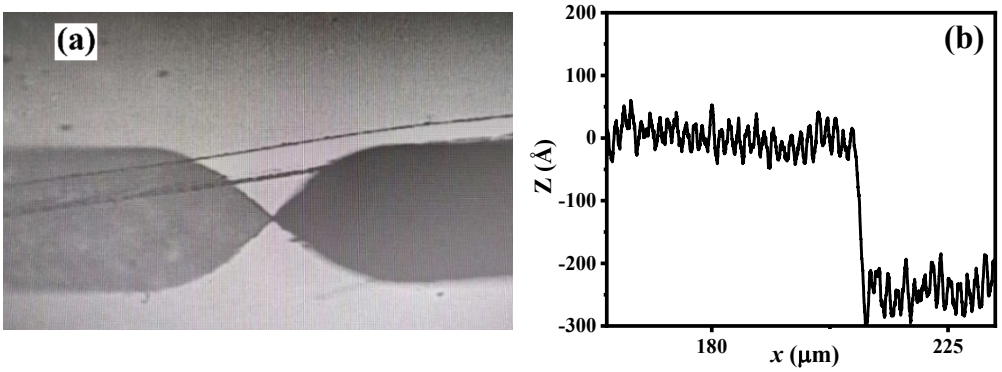

Fig. S2 (a) Surface morphology and (b) step height profile of $Zn_{0.1}Cd_{0.9}S$ thin film.

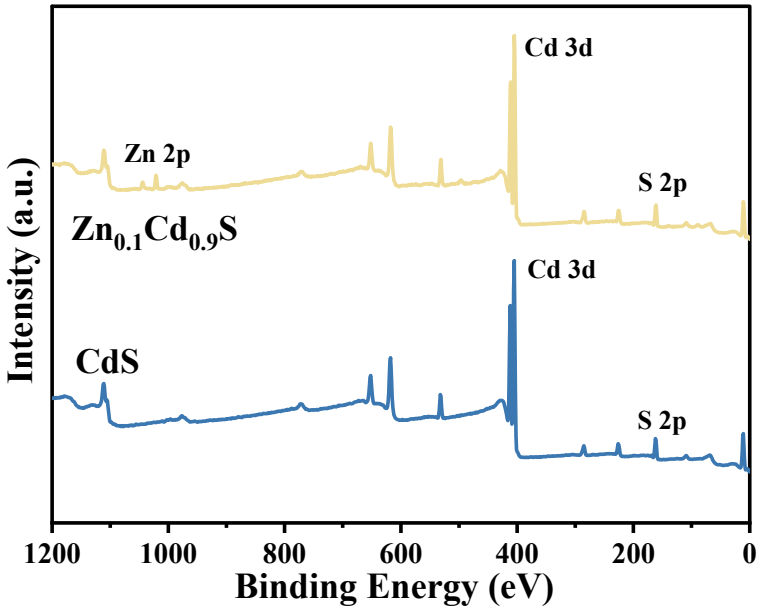

Fig. S3 XPS survey spectra of CdS and $Zn_{0.1}Cd_{0.9}S$ thin films.

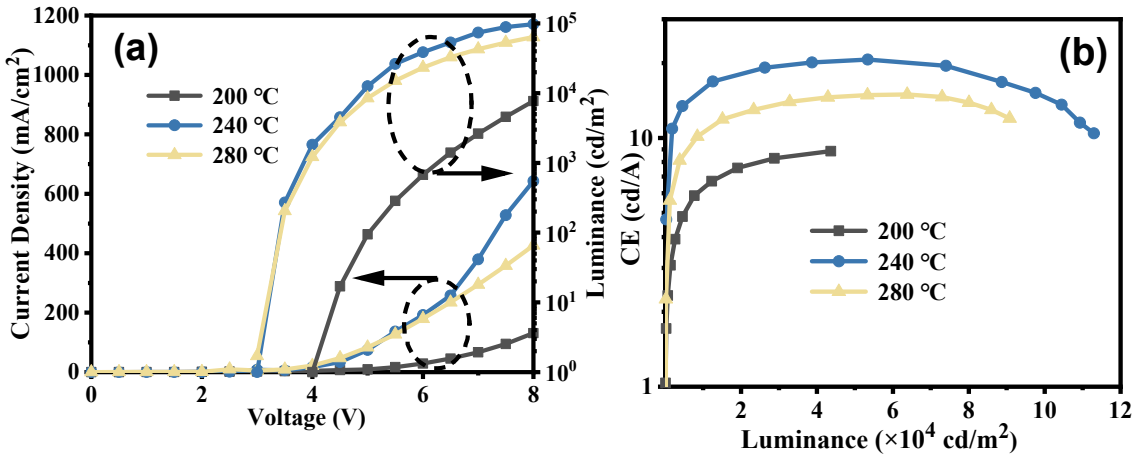

Fig. S4 (a) *J-V-L* and (b) *CE-L* characteristics of $Zn_{0.1}Cd_{0.9}S$-based QLEDs annealed at different temperatures for 15 min.

Table S2 The device parameters of $Zn_{0.1}Cd_{0.9}S$-based QLED devices annealed at different temperatures for 15 min.

Annealing temperature (°C)	V_{on} (V)	L_{max} (cd m^{-2})	CE_{max} (cd A^{-1})
200	4	43632	8.85
240	3.0	109577	20.67
280	3.0	90782	14.96

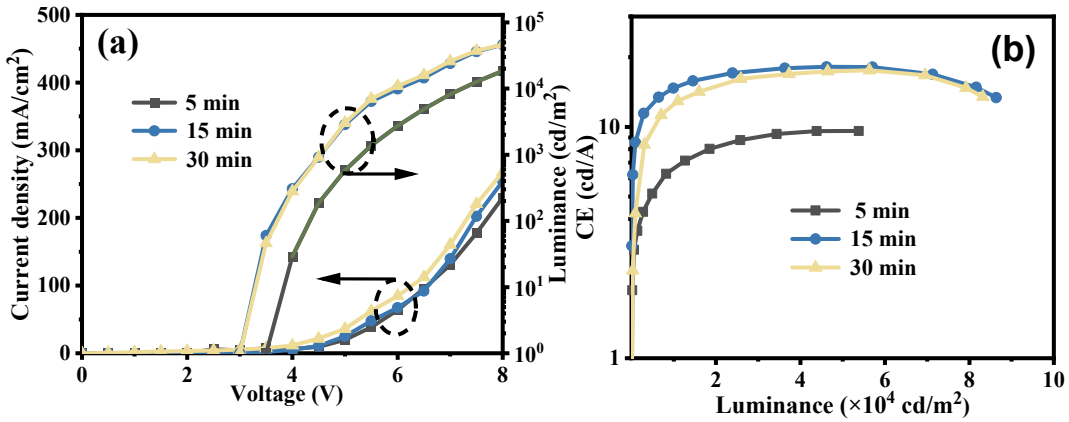

Fig. S5 (a) *J-V-L* and (b) *CE-L* characteristics of $Zn_{0.1}Cd_{0.9}S$-based QLEDs annealed at 240°C for different annealing time.

Table S3 The device parameters of $Zn_{0.1}Cd_{0.9}S$-based QLED devices annealed at 240ºC for different annealing time.

Annealing duration (min)	V_{on} (V)	L_{max} (cd m^{-2})	CE_{max} (cd A^{-1})
5	3.5	53797	9.60
15	3.0	86335	18.17
30	3.0	83210	17.55

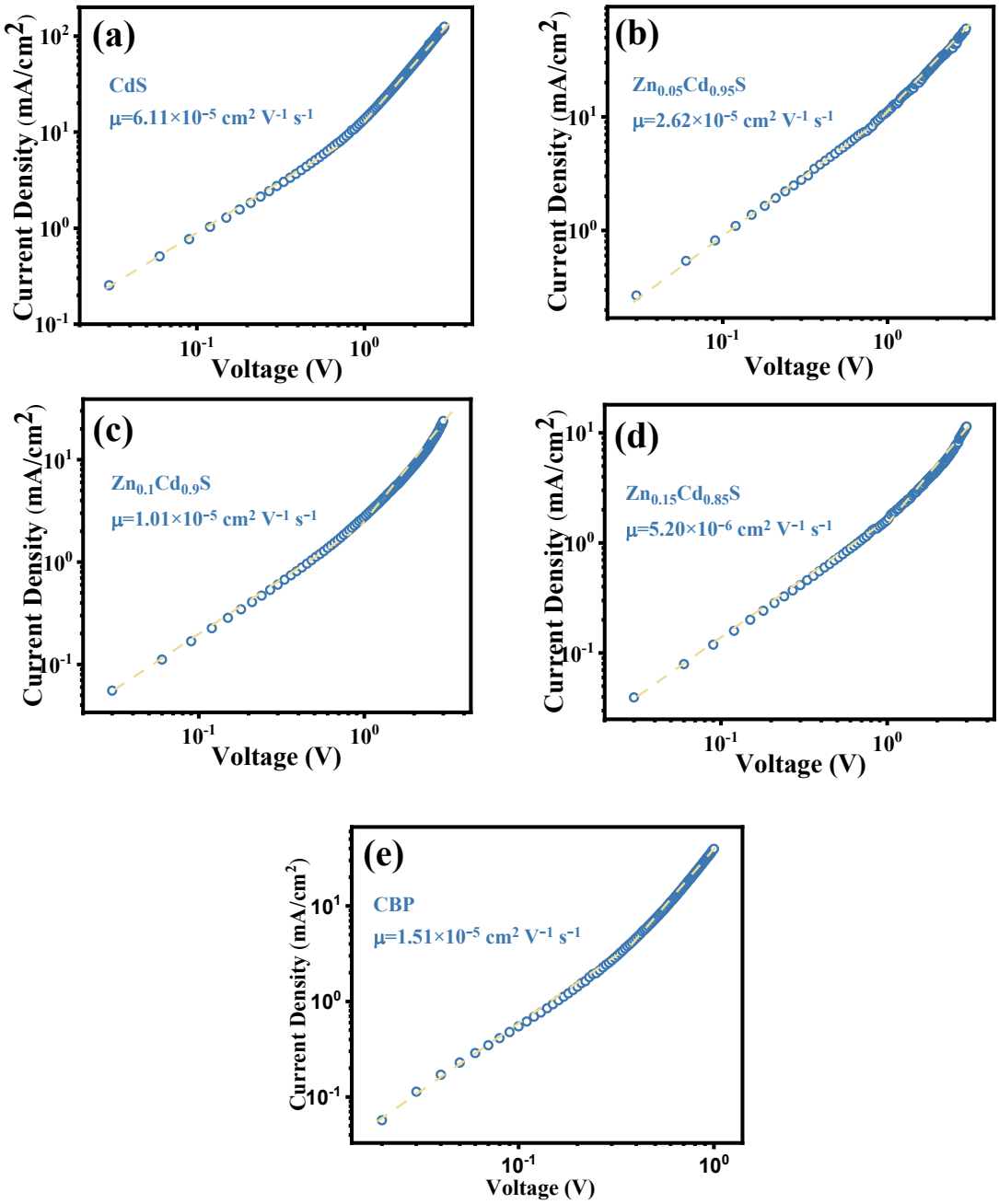

Fig. S6 *J-V* curves of (a-d) ITO/$Zn_xCd_{1-x}S$ (x =0, 2.5, 5, 7.5, 10)/Al devices and (e) ITO/CBP/MoO_3/Al device for measuring mobility.

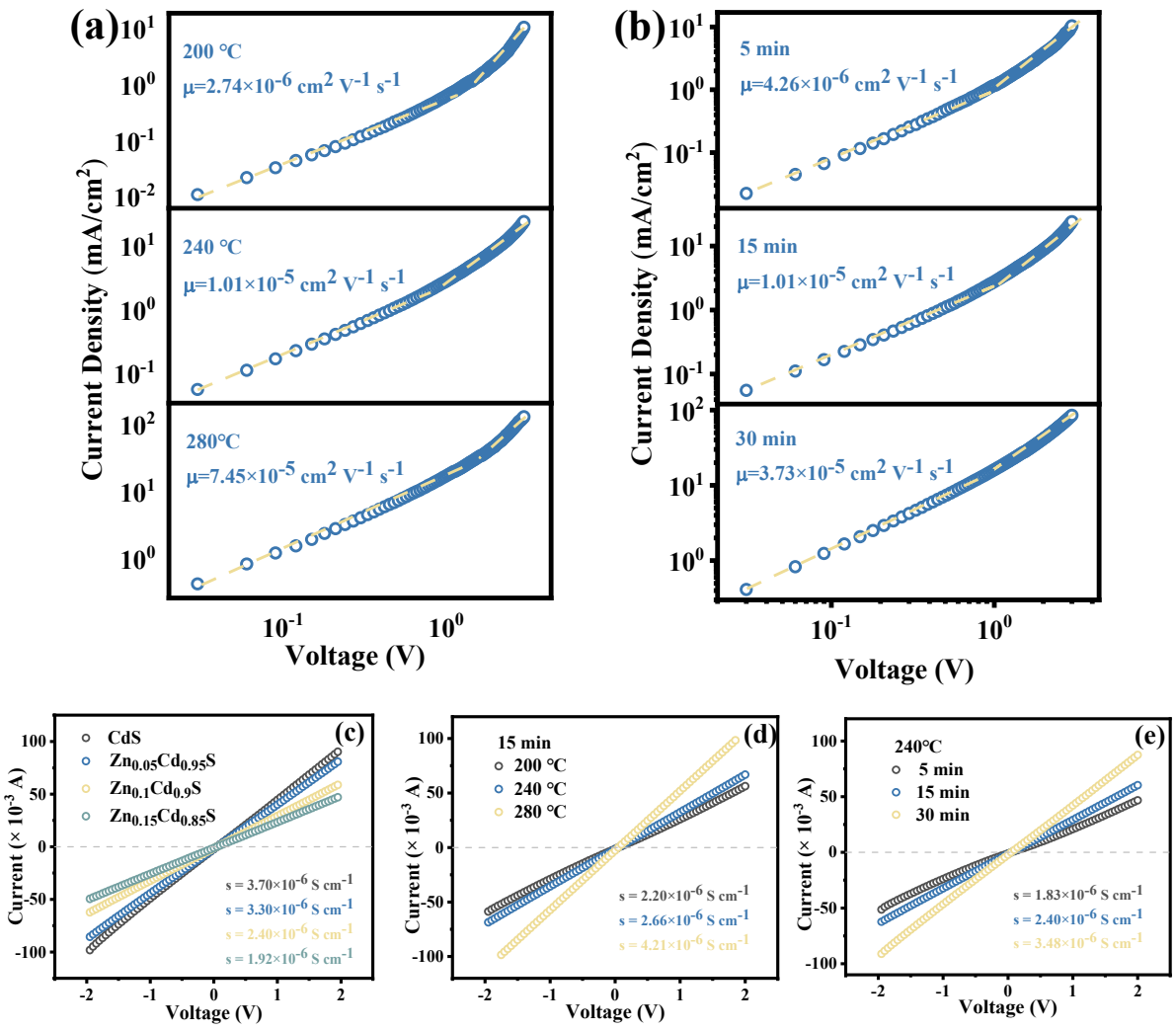

Fig. S7 *J-V* curves of the devices of ITO/$Zn_{0.1}Cd_{0.9}S$/Al for measuring the mobility of $Zn_{0.1}Cd_{0.9}S$ thin films with (a) different annealing temperatures for 15 min and (b) different annealing time at 240°C. (c) *I-V* curves of the devices of ITO/$Zn_xCd_{1-x}S$/Al for measuring the conductivity of $Zn_xCd_{1-x}S$ thin films with different Zn/Cd ratios. *I-V* curves of the devices of ITO/$Zn_{0.1}Cd_{0.9}S$/Al for measuring the conductivity of $Zn_{0.1}Cd_{0.9}S$ thin films with (d) different annealing temperatures for 15 min and (e) different annealing time at 240°C.

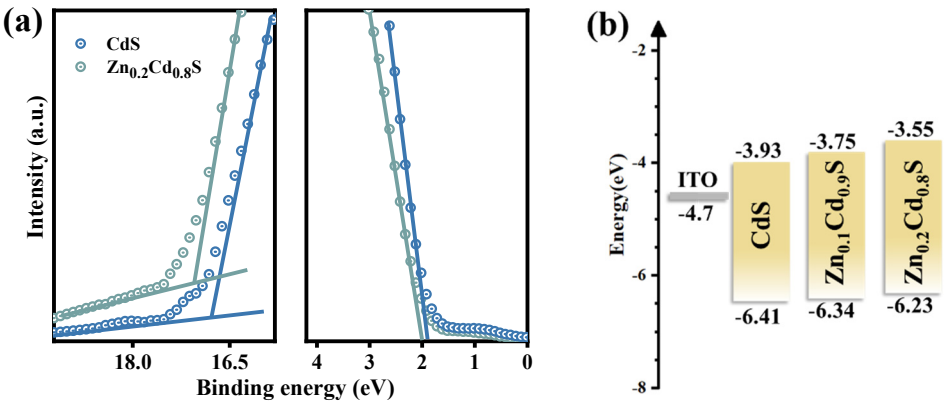

Fig. S8 (a) UPS spectra and of CdS and $Zn_{0.2}Cd_{0.8}S$ thin films. (b) Energy band diagrams of $Zn_xCd_{1-x}S$ films (x = 0, 0.1 and 0.2).

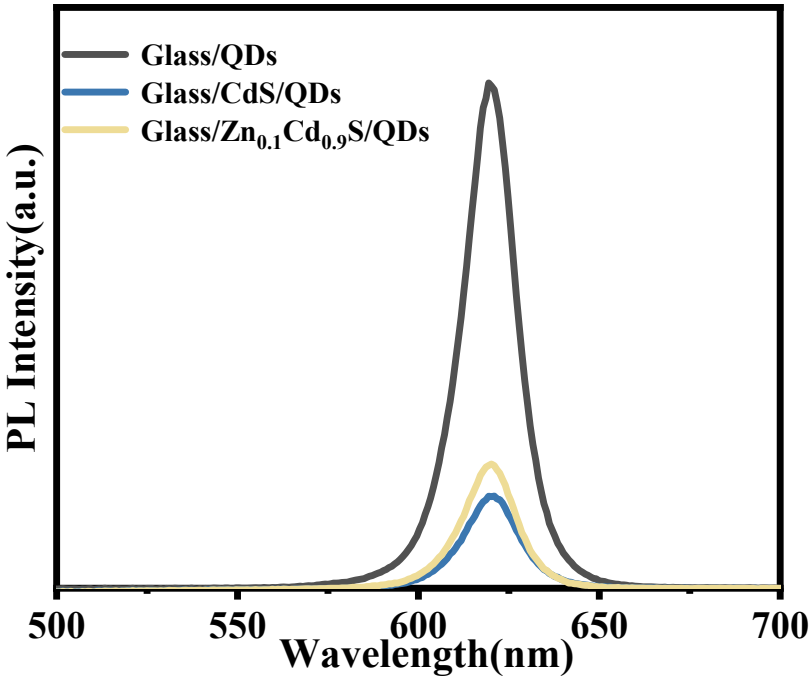

Fig. S9 PL measurements of QDs on glass, CdS and $Zn_{0.1}Cd_{0.9}S$ thin films.

References:

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