The Role of Core-Shell Interfaces on Exciton Recombination in CdSe–$Cd_xZn_{1-x}S$ Quantum Dots

Alessandro Minotto[†], Francesco Todescato[†], Ilaria Fortunati[†], Raffaella Signorini[†], Jacek J. Jasieniak[‡], and Renato Bozio[†]*

[†]Department of Chemical Science and U.R. INSTM, University of Padova, Via Marzolo 1, I-35131, Padova, Italy

[‡]Materials Science and Engineering, Ian Wark Laboratory, Commonwealth Scientific and Industrial Research Organization (CSIRO), Bayview Avenue, Clayton, 3168, Australia

SUPPORTING INFORMATION

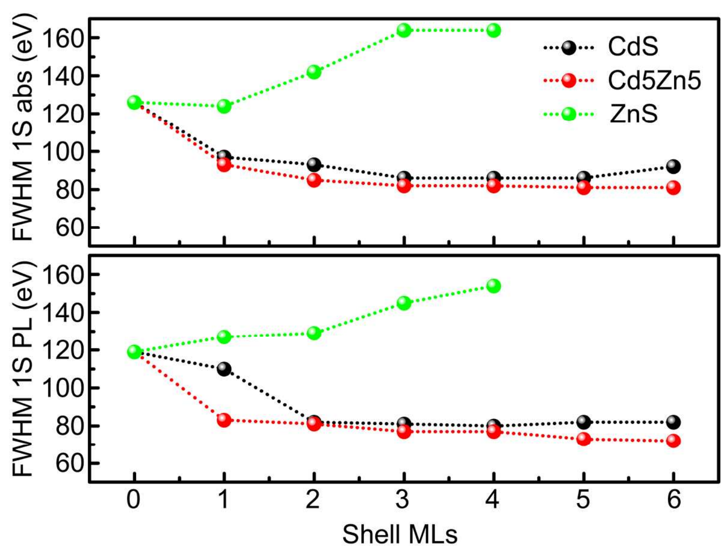

Figure A. FWHM of the band-edge absorption band (top) and PL (down). In order to extract the FWHM of the first excitonic absorption peak absorption spectra were fitted to several Gaussians[1].

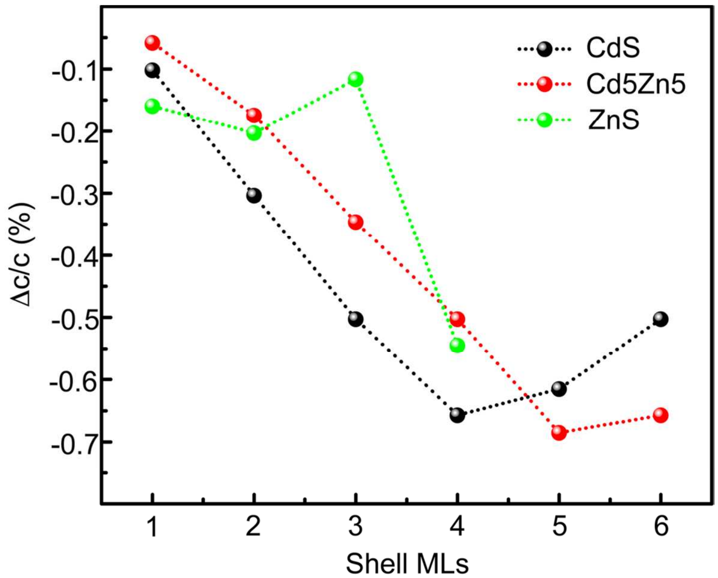

Figure B. CdSe core lattice compression, induced by CdS/Cd5Zn5/ZnS shell growth. Lattice strain was measured by Raman technique, with the same procedure reported in our previous work[2].

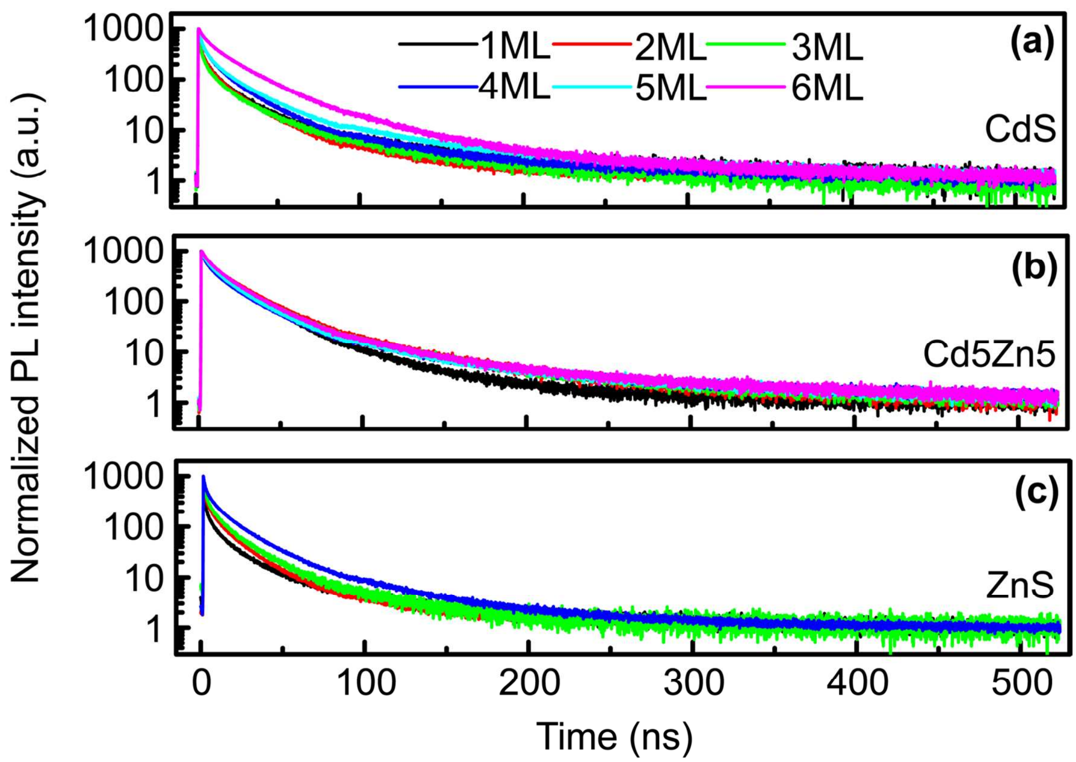

Figure C. Normalized time resolved PL decays. Time window 524 ns, SPAD binning time 128 ps.

Table X. Lifetime weighted amplitudes (A_N) (see Experimental Section) and exponential rates (Γ_N) extracted from the tri-exponential fit of TCSPC rough data

QD	*A1*	Γ_1 [MHz]	*A2*	Γ_2 [MHz]	*A3*	Γ_3 [MHz]
CdSe	0.02	**1201**	0.15	**110**	0.83	**15**
-CdS 1ML	0.08	**1086**	0.32	**131**	0.60	**15**
-CdS 2ML	0.11	**1004**	0.36	**126**	0.52	**21**
-CdS 3ML	0.12	**1000**	0.31	**137**	0.57	**18**
-CdS 4ML	0.11	**559**	0.40	**96**	0.49	**15**
-CdS 5ML	0.10	**517**	0.32	**90**	0.58	**13**
-CdS 6ML	0.08	**267**	0.64	**53**	0.28	**16**
QD	*A1*	Γ_1 [MHz]	*A2*	Γ_2 [MHz]	*A3*	Γ_3 [MHz]
CdSe	0.02	**1201**	0.15	**110**	0.83	**15**
-Cd5Zn5 1ML	0.03	**660**	0.46	**75**	0.49	**20**
-Cd5Zn5 2ML	0.03	**550**	0.56	**64**	0.51	**15**
-Cd5Zn5 3ML	0.05	**432**	0.49	**60**	0.38	**14**
-Cd5Zn5 4ML	0.07	**427**	0.53	**68**	0.43	**13**
-Cd5Zn5 5ML	0.08	**320**	0.60	**64**	0.38	**13**
-Cd5Zn5 6ML	0.09	**251**	0.46	**57**	0.31	**13**
QD	*A1*	Γ_1 [MHz]	*A2*	Γ_2 [MHz]	*A3*	Γ_3 [MHz]
CdSe	0.02	**1201**	0.15	**110**	0.83	**15**
-ZnS 1ML	0.09	**2840**	0.31	**188**	0.61	**22**
-ZnS 2ML	0.10	**1481**	0.38	**146**	0.52	**28**
-ZnS 3ML	0.08	**1131**	0.36	**131**	0.56	**26**
-ZnS 4ML	0.06	**806**	0.35	**104**	0.59	**18**

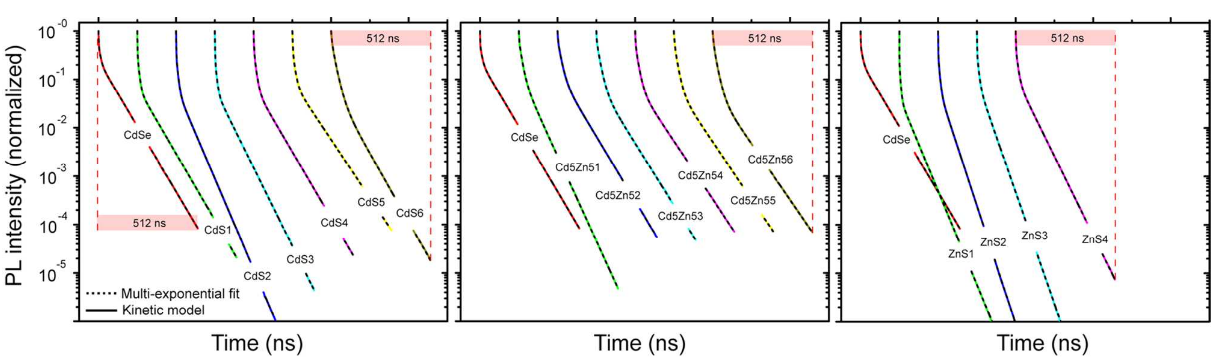

Figure D. Phenomenological model fitting of tri-exponential decay functions, derived from TCSPC data. The model (colored lines) efficiently reproduces decay functions (black dashed lines) for all the samples.

REFERENCES:

(1) Gong, K.; Zeng, Y.; Kelley, D. F. Extinction Coefficients, Oscillator Strengths and Radiative Lifetimes of CdSe, CdTe and CdTe/CdSe Nanocrystals. *J. Phys. Chem. C* **2013**, *117*, 20268–20279.

(2) Todescato, F.; Minotto, A.; Signorini, R.; Jasieniak, J. J.; Bozio, R. Investigation into the Heterostructure Interface of CdSe-Based Core-Shell Quantum Dots Using Surface-Enhanced Raman Spectroscopy. *ACS Nano* **2013**, *7*, 6649–6657.