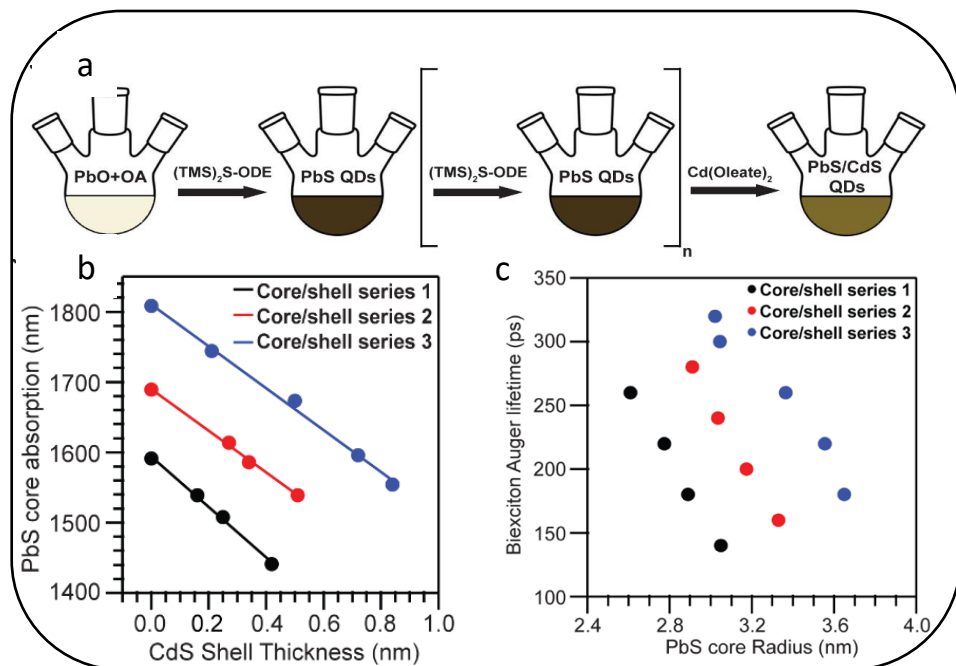


# Telecom PbS/CdS Quantum Dots with Suppressed Non-Radiative Auger

## Scientific Achievement

A CINT User Team refined synthetic protocol gives access to high-quality, monodisperse PbS/CdSe quantum dots (QDs) to the C- and L-telecommunications bands (1530-1625 nm).



**Figure:** a) Scheme of PbS QD and PbS/CdS core/shell synthesis. b) PbS core absorption versus CdS shell thickness in the three core/shell series. c) Calculated biexciton Auger lifetimes of the series, showing their correlation with PbS core radius.

## Significance and Impact

The team demonstrated significantly suppressed Auger rates, increasing biexciton Auger lifetimes,  $\tau_{xx}$ , up to 320 ps vs. previous 38-160 ps, which can facilitate lasing in the telecom window.

## Research Details

- Optically probed the QDs with transient absorption.
- Observed  $\tau_{xx}$  increased as a function of shell thickness.
- Demonstrated that photoluminescence lifetimes followed similar trend as  $\tau_{xx}$ , suggesting a similar structural origin.
- Performed structural imaging and elemental mapping to reveal interfacial alloying.

Stylianou, M.; Bowes, E. G.; Leoncino, L.; Brescia, R.; Nisoli, V.; Malone, N. A.; Geisenhoff, J. Q.; Hollingsworth, J. A.; Othonos, A.; Christodoulou, S. Synthesis of Monodisperse PbS/CdS Colloidal Quantum Dots Emitting at Telecommunication Wavelengths with Suppressed Auger Rates and Gain Threshold. *Nano Letters*. 2026.

Work was performed, in part, at the Center for Integrated Nanotechnologies.