Supporting Information for:

Infrared Emitting PbS Nanocrystal Solids through Matrix Encapsulation.

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**Volume fraction calculations.** Suppose that on average a unit length of the mixed nanocrystal film contains $N_c$ of CdS and $N_p$ and core/shell nanocrystals. A unit volume of such film be given by 

$$ (N_p D_{P/C} + N_c D_{C})^3 $$

where $D_{P/C}$ and $D_{C}$ are the average diameters of PbS/CdS and CdS NCs, respectively. The number of PbS cores in a unit volume will be given by 

$$ \frac{N_p}{N} \times (N_p + N_c)^3 $$

where $N = N_p + N_c$, where $N = N_c + N_p$. Therefore the volume fraction can be expressed as:

$$ \frac{V_{PbS}}{V_{CdS}} = \frac{\frac{N_p}{N} \times (N_p + N_c)^3 \times \frac{4}{3} \pi R_{core}^3}{(N_p D_{P/C} + N_c D_{C})^3} = \frac{(n+1)^2 \times \frac{4}{3} \pi R_{core}^3}{(nD_c + D_{P/C})^3} $$

where $n=N_p/N_c$, and $R_{core}$ is the average radius of the PbS core domain in PbS/CdS core/shell nanoparticles.
Figure SF1: Fluorescence intensity decay of CdS-encapsulated PbS nanocrystals. The fast and the slow decay components correspond to charge transfer and charge trapping processes, respectively.
Figure SF2: (top). Steady-state emission of PbS/CdS core/shell NCs in solution (black curve) and encapsulated into a film (red curve). (bottom). Fluorescence intensity decay of OA-acid capped PbS/CdS core/shell NCs in solution.
Figure SF3: Steady-state emission of PbS/CdS solids featuring large $R_{\text{edge}}$ distances. The use of a conventional SMENA methodology leads to excessive trap state emission in the $\lambda=500-800$ nm range.
Table ST1: Quantum yield of CdS-encapsulated PbS NC solids emitting at $\lambda_{\text{PbS}} = 1300$ nm. The relative error of Quantum Yield measurement is about 15%. The effects of self-absorption were neglected due to low optical density of the samples.

<table>
<thead>
<tr>
<th>Sample $(\lambda_{\text{PbS}}=1300 \text{ nm})$</th>
<th>PbS volume fraction ($\nu_{\text{PbS}}$)</th>
<th>Optical density @808 nm</th>
<th>Quantum Yield, %</th>
<th>Life time, ns</th>
</tr>
</thead>
<tbody>
<tr>
<td>R$_{\text{edge}}$=2.5 nm</td>
<td>0.24</td>
<td>0.032</td>
<td>2.0</td>
<td>105</td>
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<tr>
<td>R$_{\text{edge}}$=6.5 nm</td>
<td>0.096</td>
<td>0.015</td>
<td>3.3</td>
<td>350</td>
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<tr>
<td>R$_{\text{edge}}$=7.9 nm</td>
<td>0.07</td>
<td>0.015</td>
<td>3.7</td>
<td>480</td>
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</table>
Figure SF4: Spectra of laser and PL emission of the solid with $R_{\text{edge}}=2.5$ nm, Transmission spectra of longpass and shortpass filters applied for quantum yield.
Figure SF5: Absorption spectra of samples measured with integrating sphere spectrometer.
Figure SF6: High resolution TEM image of PbS/CdS core/shell NCs.