

## Supplementary Information

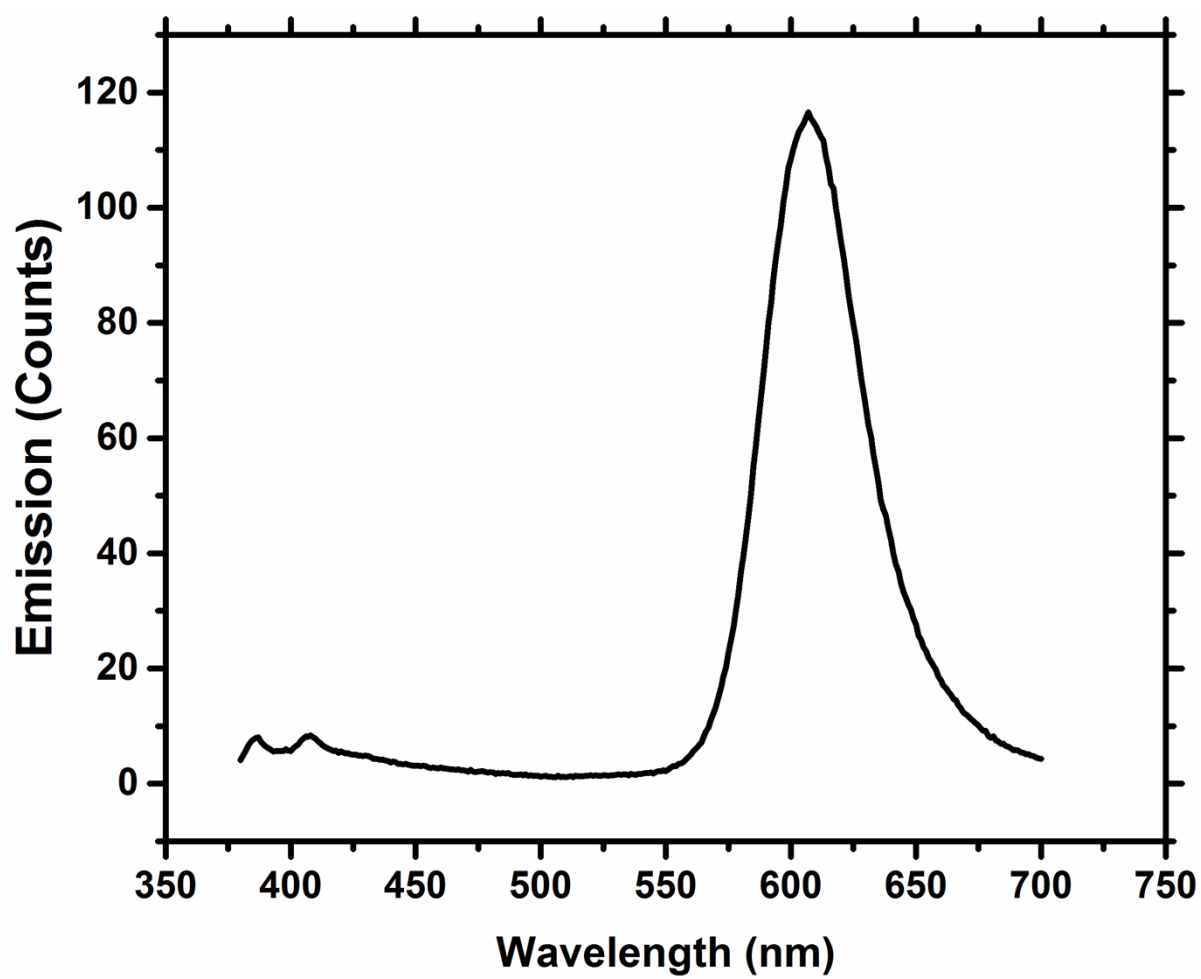
### **Advanced Analysis of Nanoparticle Composites – A Means toward Increasing the Efficiency of Functional Materials.**

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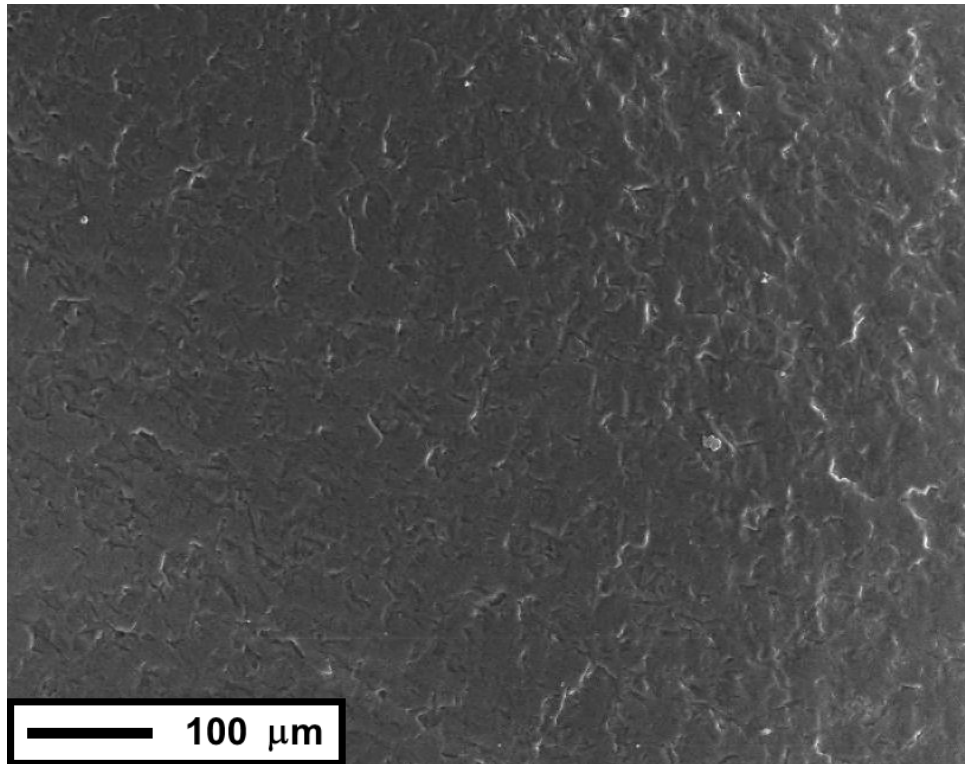
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**S1.** Fluorescence emission spectrum of the CdSe@ZnS quantum dot nanoparticles. The emission peak is centred on a wavelength of 707 nm.

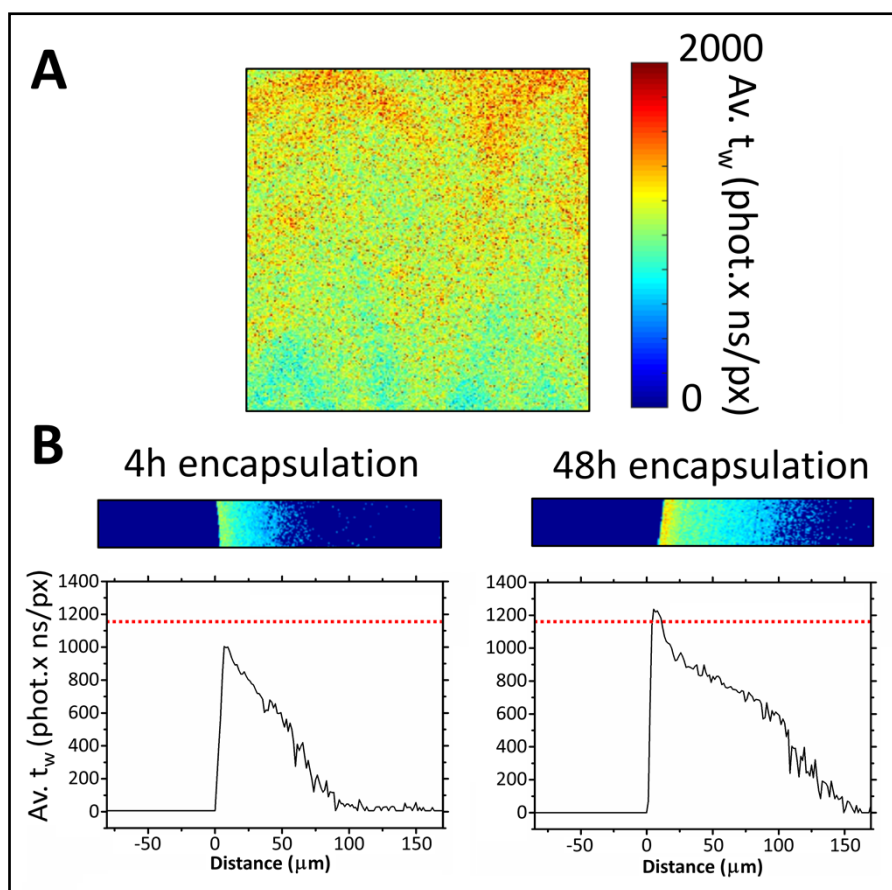


**S2.** SEM image showing a PDMS sample after 48 hours of exposure to a swell encapsulation solution. The development of the wrinkles in the surface is a direct result of the swelling/shrinking process. Scale bar shown.

<b>CdSe Nanoparticle Swell Encapsulation (ZnS - Coating)</b>				
<b>Swell Time Hours</b>	<b>Cd (atomic %)</b>	<b>Se (atomic %)</b>	<b>Zn (atomic %)</b>	<b>S (atomic %)</b>
<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>4</b>	<b>0.05</b>	<b>0.05</b>	<b>0.1</b>	<b>0.1</b>
<b>24</b>	<b>0.1</b>	<b>0.1</b>	<b>0.3</b>	<b>0.3</b>
<b>48</b>	<b>0.3</b>	<b>0.3</b>	<b>0.7</b>	<b>0.7</b>

<b>TiO<sub>2</sub> Nanoparticle Swell Encapsulation</b>	
<b>Swell Time Hours</b>	<b>Ti (atomic %)</b>
<b>1</b>	<b>0.1</b>
<b>3</b>	<b>0.2</b>
<b>6</b>	<b>0.2</b>
<b>24</b>	<b>0.4</b>

**S3.** Table showing EDX data of the swell encapsulated samples. EDX analysis is not an accurate measure of nanoparticle surface concentration, as the detection volume extends into the bulk of the polymer. The relative increase in this concentration indicates the relative increase within this detection volume.



**S4.** Fluorescence intensity weighted lifetime maps of CdSe QD samples. **(A)** Shows the calculated map for the 0.7  $\mu\text{M}$  CdSe QD swelling solution in n-Hexane (control measurement without polymer sample). The average value extracted from this image is 1164 photons  $\times$  ns per pixel. **(B)** Profile plots of the PDMS samples swell encapsulated with 0.7  $\mu\text{M}$  CdSe QD swelling solution in n-Hexane for 4 and 48 hours, respectively. The dimensions of the slices shown are 35  $\times$  350  $\mu\text{m}$ . The average of the intensity weighted lifetime is calculated and plotted with the penetration distance into the PDMS. The red dashed line indicates the average value obtained from the CdSe QDs in the swelling solution **(A)**, indicating that the concentration of NPs at the edges of the polymer after 48 hours of swell encapsulation, and NPs in the swelling solution, are very similar.