Supplementary Information

S1. Optical and TEM Analysis of QDs



Figure S1a. Fluorescence spectrum of CdTeSe QDs.

Figure S1a has been showed emission spectra of CdTeSe QDs in water for different time intervals. The crystals began to form within 2 hours and grow until the red emission region after 20 hours.



Figure S1b. TEM image of CdTeSe QDs

The obtained QDs were characterized by TEM analysis. As can be seen in Figure S1b, QDs have particle sizes of approximately 5 nm. They were well separated and more or less spherical with clear lattice fringes.

S2. Optical Characterization of Blank and Composite Membranes



Figure S2a. Blank membrane

Photographs of blank membranes were taken under sun light (in Figure S2a). They are very thin and transparent.



Figure 1b (in main manuscript). A piece of composite membrane under UV lamp.

And also, Fig. 1(b) shows photoluminescence (PL) spectrum of CdTeSe QDs in membrane. They have red emission in composite situation.



Figure S2b. Blank membrane



Figure S2c. Composite membrane with QDs



Figure S2d. Composite membrane with QDs



Figure S2e. Composite membrane with QDs

Figure S2b, c, d, e: Confocal microscope of images of QDs-membrane hybrids: QDs are on the surface of membranes (Confocal images on the left was obtained by laser exciting (excitation UV, emission 660 nm) and right images were obtained by beam).

In Figure S2b, there is no any emission in blank membrane. In Fig. 2S c, d, e, confocal microscopy images of QDs-membrane prepared with 0.1% CdTeSe QDs solution are presented. Quantum dots are not only on the surface of the membrane, they are also available inside the membrane. We can understand this distribution from the emissions of QDs in confocal microscope images with different scales. And also, the less obvious emissions from bottom sides of membrane have been showed that nanocrystals are scattered all over the membrane.

S3. FT-IR analysis of Blank and Composite Membranes and Surface Ligands



Figure S3a. FT-IR spectra of blank membrane.







Figure S3c. FT-IR spectra of DDT.

Figure S3a has been showed FT-IR spectrum of the blank membrane. FT-IR spectra of blank and composite membranes were obtained analogously. Because blank membrane has great peaks in the spectrum. But, when we substract FT-IR spectrum of the blank membrane from FT-IR spectrum of PIM prepared with 0.1% CdTeSe QDs, we obtaine Figure 5 (in main manuscript). In Figure 5, the spectrum looks like to that of pure MPA and the peaks of FT-IR spectrum of MPA is similar (Figure S3b). Thus, it was confirmed that QDs were in the membranes prepared with nanocrystals. After ligand echange process, there must be DDT on the surface of QDs and indirectly in composite membrane. The amount of DDT on the surface of QDs is fairly low after ligand echange process. So, we can barely see the peaks of DDT in FTIR of composite membrane due to dominant peaks of CTA.

S4. QDs-PIM Transport Experiments



Figure S4a. Transport of RB.



Figure S4b. Transport of RB depending on time.

Figure S4a shows transport of RB. RB amount inside the membrane in each time was calculated by subtracting the percentage of RB in phases (feed and stripping) to the original amount, corresponding to feed phase at the beginning of the experiment. As seen in Figure S4b, RB amount inside the membrane rose at the beginning and decreased slowly. The first 6h of the procedure was related to the charge of the membrane and the rest corresponded to the progressive discharge of RB into the stripping phase. The surface of the membrane results was not observed accumulation because of RB for the transport of stripping phases.

S5. Other types of dyes on the transport of RB



Figure S5. Transport of different dyes depending on time.

The facilitated transport of the PIM was investigated by performing the competitive transport of methylene blue, alizarin yellow and Reactive Black 5 from feed phase containing these dyes together at the stripping phase. As can be seen in Figure S5, any transport for methylene blue, alizarin yellow and Reactive Black 5 (an industrial dye) was not observed by using prepared PIM (Feed phase concentration: 0.005% RB; pH of feed phase: 12.19; stripping phase concentration: 1M HCl; QDs concentration in membrane: 0.1%).