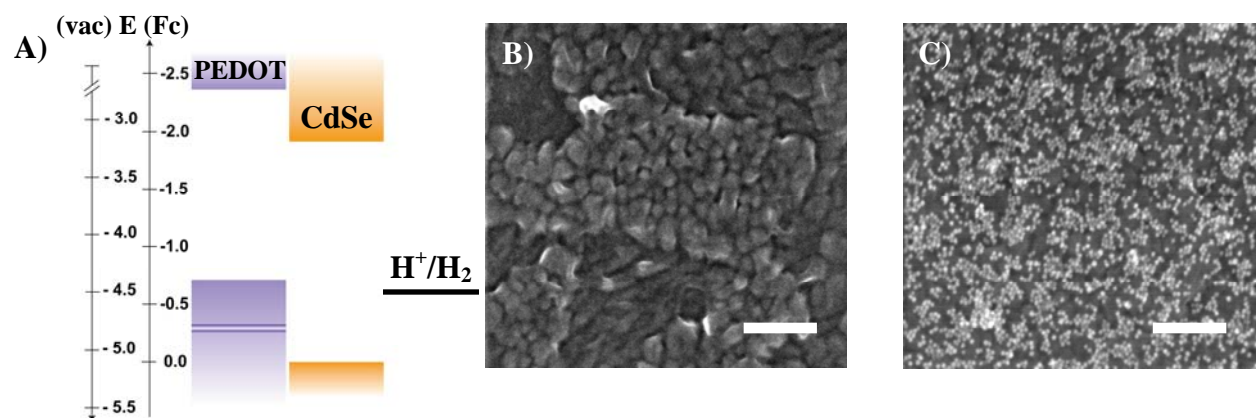


# HYBRID THIN FILMS COMPOSED OF CdSe NANOCRYSTALS CROSSLINKED WITH AN ELECTRON RICH POLYMER (PEDOT): PHOTOELECTROCHEMICAL HYDROGEN GENERATION

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Semiconducting nanocrystals are attractive light harvesting materials due to their tunable light absorption window throughout the UV to mid-IR range (composition/size), large extinction coefficients ( $10^5 - 10^6 \text{ L mol}^{-1} \text{ cm}^{-1}$ ), along with ease of surface functionalization and synthesis. This work focuses on a hybrid CdSe nanocrystal/conductive polymer composite material that is employed as a platform for photoelectrochemical reduction of a solution acceptor (e.g.  $\text{C}_{60}$  or  $\text{H}_2\text{O}$ ).<sup>1</sup> The bottom up approach of first wiring an electron-rich conductive polymer (poly-3,4-ethylenedioxythiophene, PEDOT) to the ITO electrode, followed by oxidative crosslinking of monomer-functionalized nanocrystals to the polymer film affords a vectorally-aligned solid support for photo-assisted electron transfer reactions. This system relies on close proximity of the electron rich polymer (PEDOT) for concerted hole capture during photo-assisted electron transfer to aqueous solutions in order to produce hydrogen. The CdSe nanocrystal-sensitized polymer film is further optimized for hydrogen generation by photo-assisted platinization of the nanocrystals. This poster will focus on experimental details concerned with the morphology of the corresponding hybrid thin films and their photoelectrochemistry with aqueous solutions.



**Figure 1.** A) Energy level diagram for PEDOT, ~ 5 nm CdSe nanocrystals and the  $\text{H}^+/\text{H}_2$  couple. B) 1.8 mC/cm<sup>2</sup> PEDOT film on ITO C) ~ 5 nm CdSe nanocrystals crosslinked onto a PEDOT film (scale bar in B and C = 100 nm). The HOMO of PEDOT was taken from cyclic voltammetry and the LUMO of ~ 5 nm CdSe nanocrystals was estimated from spectroelectrochemical bleaching experiments.<sup>2</sup> The optical band gaps of both PEDOT and ~ 5 nm nanocrystals was used to complete the diagram.

## References

- 1) Shallcross et al. *J. Am. Chem. Soc.* **2007**, *129*, 11310.
- 2) Wang et al. *Science* **2001**, *291*, 2390.