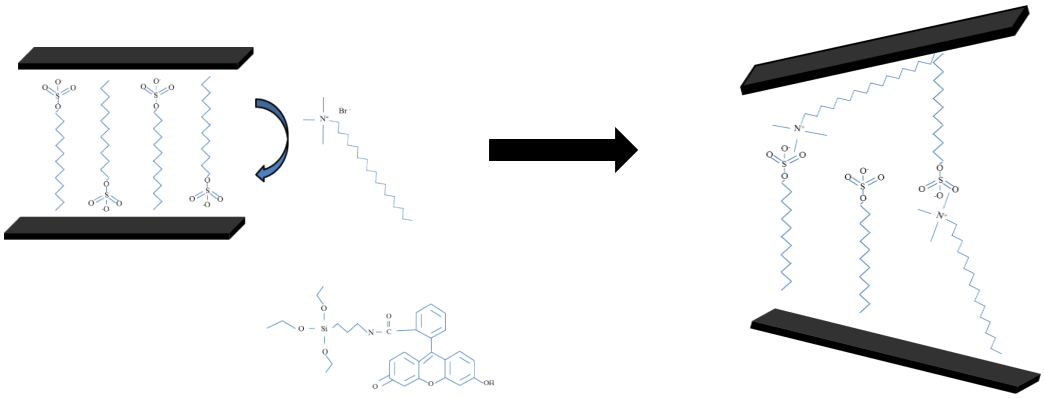
Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

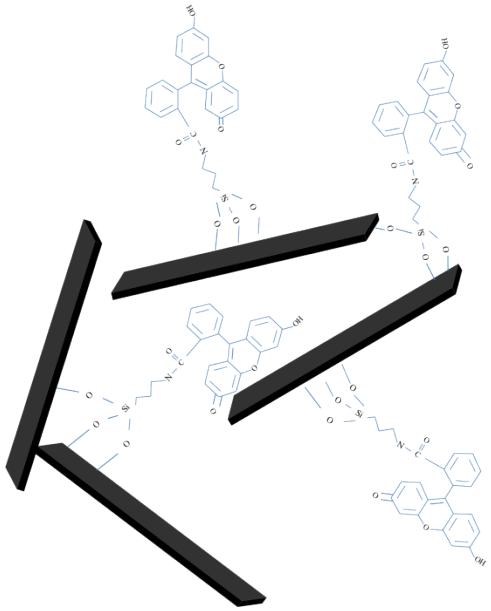

**Supporting information**

**1.**



CTAB extraction of SDS from LDH gallery: CTAB has high affinity towards SDS to form salt.[1] The role of SDS molecules is to expand the gallery of LDH nanoparticle, which helps the incorporation of APTES-Dye molecules into the LDH interlayers.

**2.**



With strong ultrasonication, LDH-SDS nanoparticles defoliated and APTES-dye connected LDH layers together and assembled to amorphous nanoparticles.

**Scheme S1.** Schematic illustration of the preparation of Dye conjugated self-assembled LDH nanoparticles.[2]

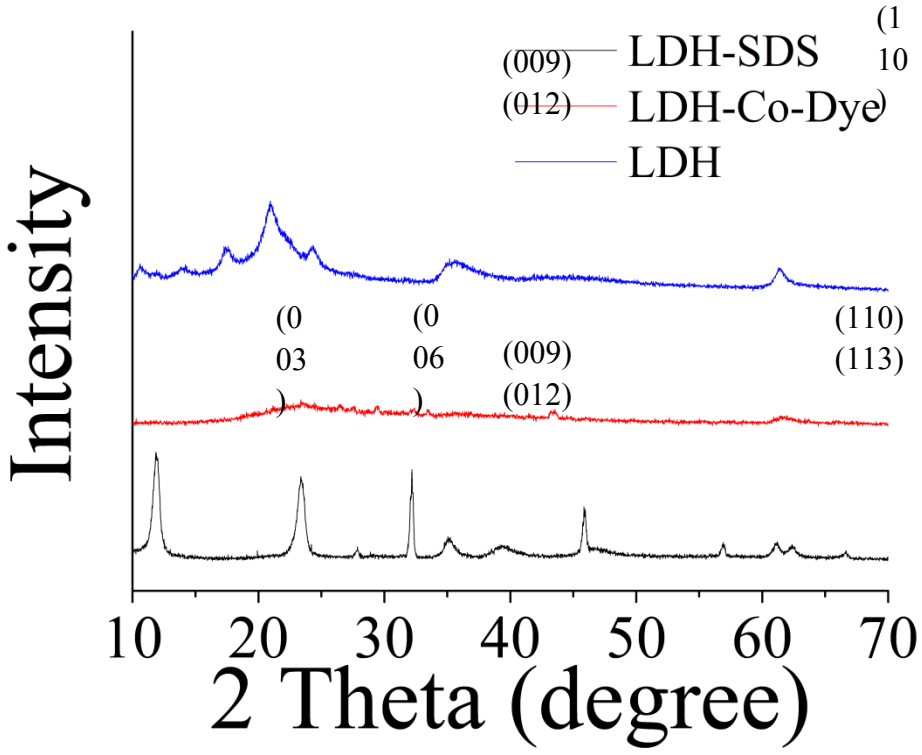



**Fig. S1.** Powder X-ray diffraction patterns of LDH-SDS nanoparticles, fluorescein conjugated LDH nanoparticles (LDH-Co-Dye) and pristine LDH nanoparticles.

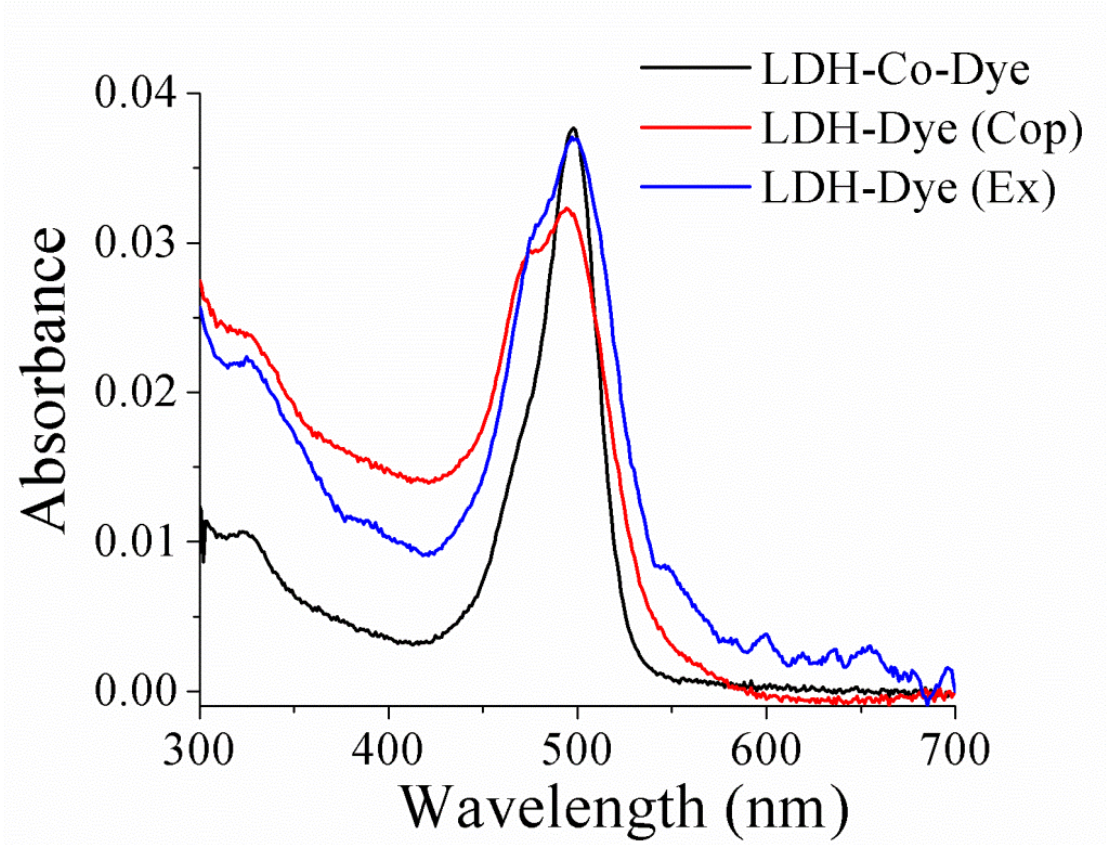



**Fig. S2.** UV-Vis absorption spectra of fluorescein covalently conjugated LDH nanoparticles (LDH-Co-Dye), and LDH-dye hybrid prepared by ion-exchange (LDH-Dye (Ex)) or co-precipitation (LDH-Dye (CoP)).

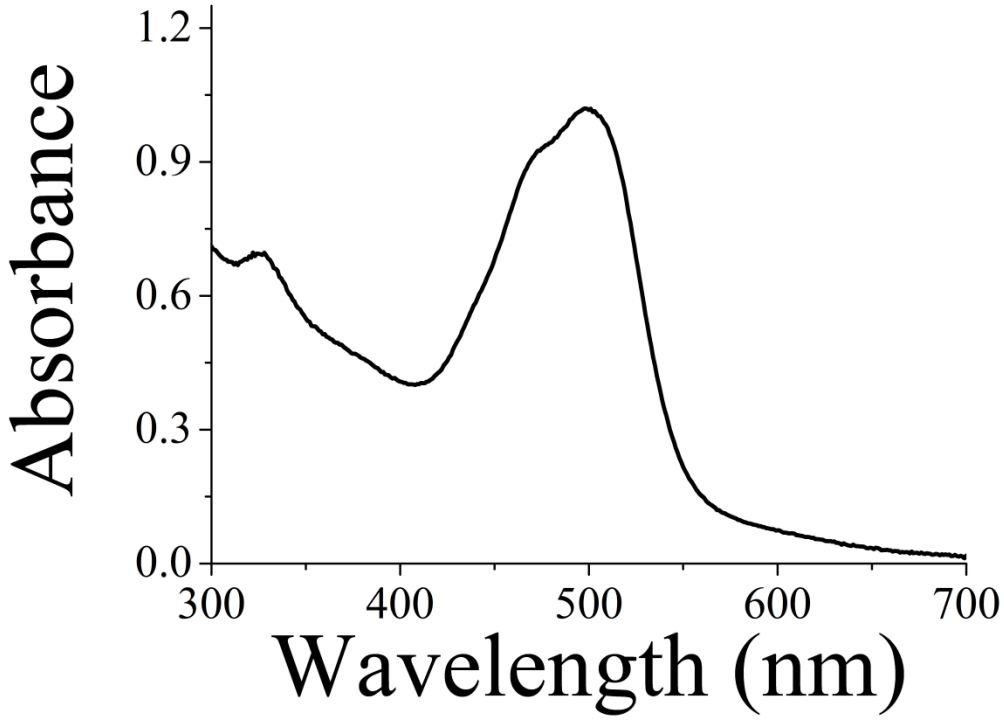



**Fig. S3.** UV-Vis absorption spectra of powder form of dye covalently conjugated LDH nanoparticles (LDH-Co-Dye).

From the absorption spectra shown in Fig. S2 and S3, we can observe that the absorption peak of dye is maintained at the same position regardless in liquid or solid form and what approach is used for the preparation.

## References

1 A. Park, H. Kwon, A. Woo and S. Kim, *Adv. Mater.,* 2005*,* **17**, 106.

2 L. Yan, W. Chen, X. Zhu, L. Huang, Z. Wang, G. Zhu, V. A. Roy, K. N. Yu and X. Chen, *Chem. Commun.,* 2013*,* **49**, 10938.