Supplementary Information

Self-assembly of Supra-Amphiphiles based on Dual Charge-transfer Interactions: from Nanosheets to Nanofibers

Kai Liu,[a] Yuxing Yao,[a] Yu Liu,[b] Chao Wang, [a] Zhibo Li,[b] and Xi Zhang*[a]

[a] Key Lab of Organic Optoelectronics & Molecular Engineering, Department of Chemistry, Tsinghua University, Beijing 100084 ,China

[b] Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China.

1. BNDIV self-assembles into small nanosheets, whereas BNAPHV self-assembles into micelles, as shown in Figure S1.

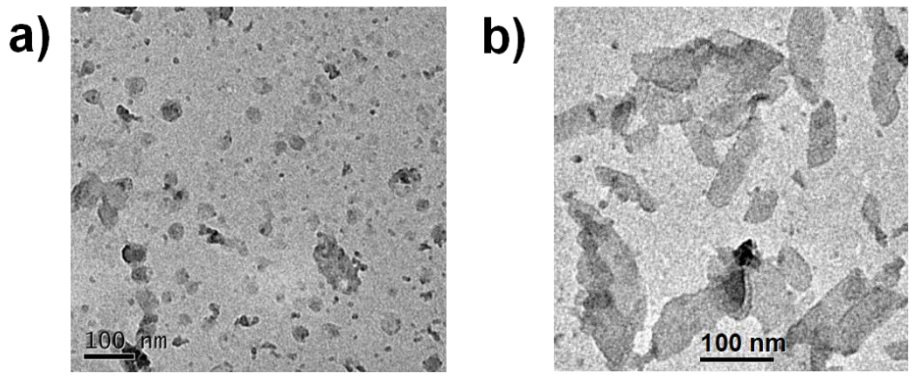

Figure S1. TEM images of a) BNAPHV and b) BNDIV assemblies.

2. We have compared the fluorescence spectrum of BNDIV/$(PYR)_2$, BNAPHV/$(PYR)_2$ and BNDIV/BNAPHV/$(PYR)_4$, where the concentration of PYR is fixed. As shown in Figure S2, the emission of PYR in BNDIV/BNAPHV/$(PYR)_4$ dual charge-transfer complex is lower than that in the single charge-transfer complexes, i.e. BNDIV/$(PYR)_2$ or BNAPHV/$(PYR)_2$. In other words, the quenching extent is enlarged in the ternary systems, indicating a stronger intermolecular interaction in the dual charge-transfer complexes. It should arise from the cooperativity between the dual charge-transfer interactions.

In our understanding, upon the addition of PYR, the pre-formed

"H-shape supra-amphiphile" maybe deformed, e.g. rotated, by the strong interaction of terminal viologen units with PYR. As a result, the PYR molecules don't have to intercalate between the viologen units on the neighboring bola-amphiphiles. Otherwise, the packing of the NDI and NAPH hydrophobic aromatic rings will be loose, which is unfavorable in water.

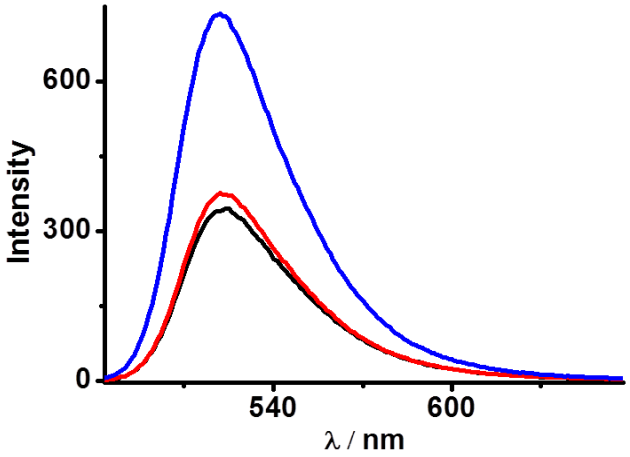

Figure S2. Fluorescence spectrum of the BNDIV/$(PYR)_2$ (blue curve), BNAPHV/$(PYR)_2$ (red curve) and BNDIV/BNAPHV/$(PYR)_4$ (black curve) complex solutions.

3. The distribution of the width of ultra-long nanofibers. Please refer to line 10 on page 12 in the maintext and Figure S3 in the supporting information. The nanofibers are quite uniform with a diameter of about 4.6 nm.

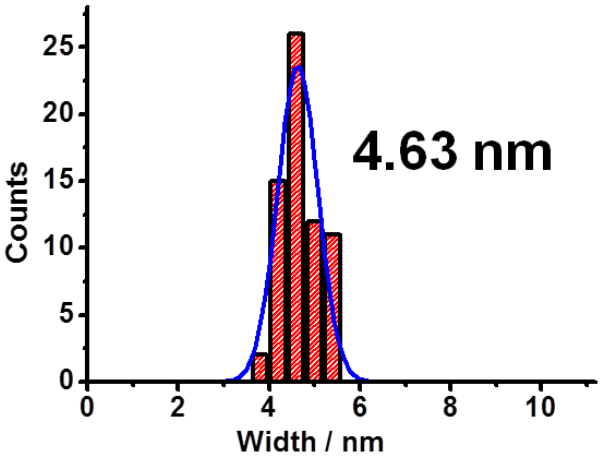

Figure S3 Distributions of the width of the BNDIV-BNAPHV/$(PYR)_4$ nanofibers.