Support Information

1. Experimental

Chemicals

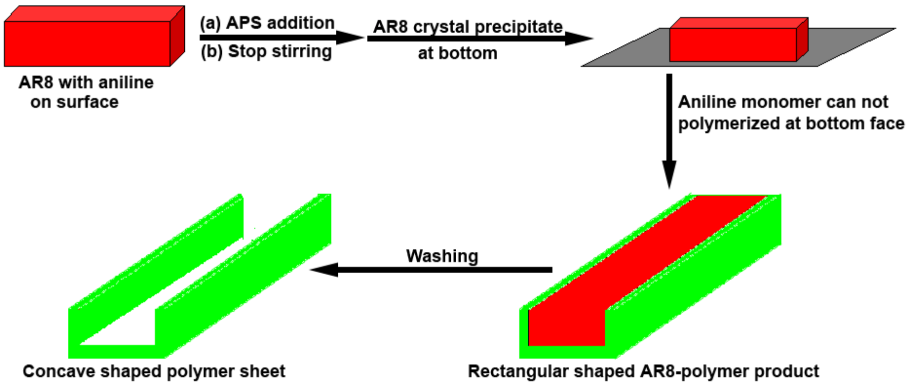
Aniline, Acid Red 8 and ammonium persulfate (APS) were purchased from Sigma-Aldrich. Aniline was distilled under reduced pressure prior to use and other chemicals were used as received.

Preparation of rectangular shaped core-shell AR8-PANI products

0.25 ml (2.75 mM) of aniline was added to 0.132 g (0.275 mM) of Acid Red 8 (AR8) in 15 ml of HCl solution (0.67 M). The mixture was stirred for half hour while the temperature was reduced to 2.5 ^{o}C using a water circulator. 0.58 g of Ammonium persulfate (APS) in 10 ml of distilled water was added to the solution to effect the polymerization of the aniline. The reaction mixture was allowed to react for a further 18 hours before the polyaniline (PANI) products are collected. A series of AR8-PANI products were prepared by varying the molar ratio of aniline to AR8 to investigate the releasing behavior. The effect of the starting aniline concentrations used and the temperature was also investigated.

Preparation of concave-shaped PANI nanosheets

The procedure was same with that of rectangular shaped core-shell AR8-PANI products except stirring was stop after 1 min of APS addition.



Scheme S1. Formation process of concave shaped PANI sheets.

In vitro Release Study

The release of AR8 dye from rectangular shaped core-shell AR8-PANI products for ten samples was monitored as a function of incubation time in PBS at 37 ^{o}C. The samples were immersed in 10 mL of PBS (pH 7.2). At specific times, 2 ml of sample solution was extracted and extra 2 ml of fresh PBS buffer solution was supplemented into the sample solution. The concentration of AR8 dye in the extracted solution was determined by a UV-vis Spectrophotometer (UV-1601PC, SHIMADZU).

Characterization

SEM was performed with a JSM-6700F electron microscope operated at 5 kV. TEM was performed with a JEM-2010F electron microscope at an acceleration voltage of 200kV. The absorption spectra of the PANI nanostructures were recorded with a UV-vis spectrophotometer (UV-1601PC, SHIMADZU). The molecular structure of the PANI nanostructures was determined by FTIR spectroscopy (FTS3000, BIO-RAD EXCALIBUR Series). X-Ray diffraction (XRD) patterns of the samples were recorded on a Siemens D5005 diffractometer equipped with a Cu Ka (1.5405 A°) X-ray source.

2. The SEM image of AR8 crystals.

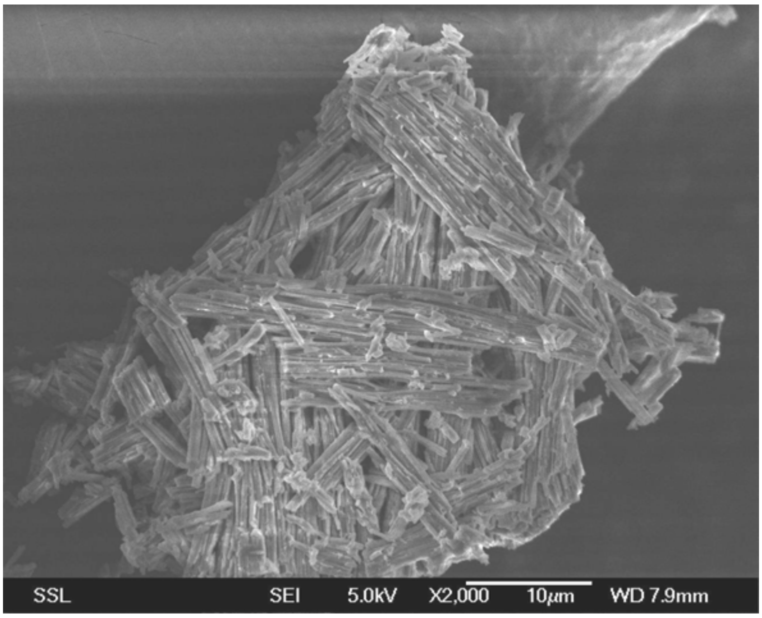


Figure S1. SEM photo of Red Acid 8 crystals.

3. Effect of the ratio of [An]/[AR8] on the morphology of rectangular shaped core-shell AR8-PANI products

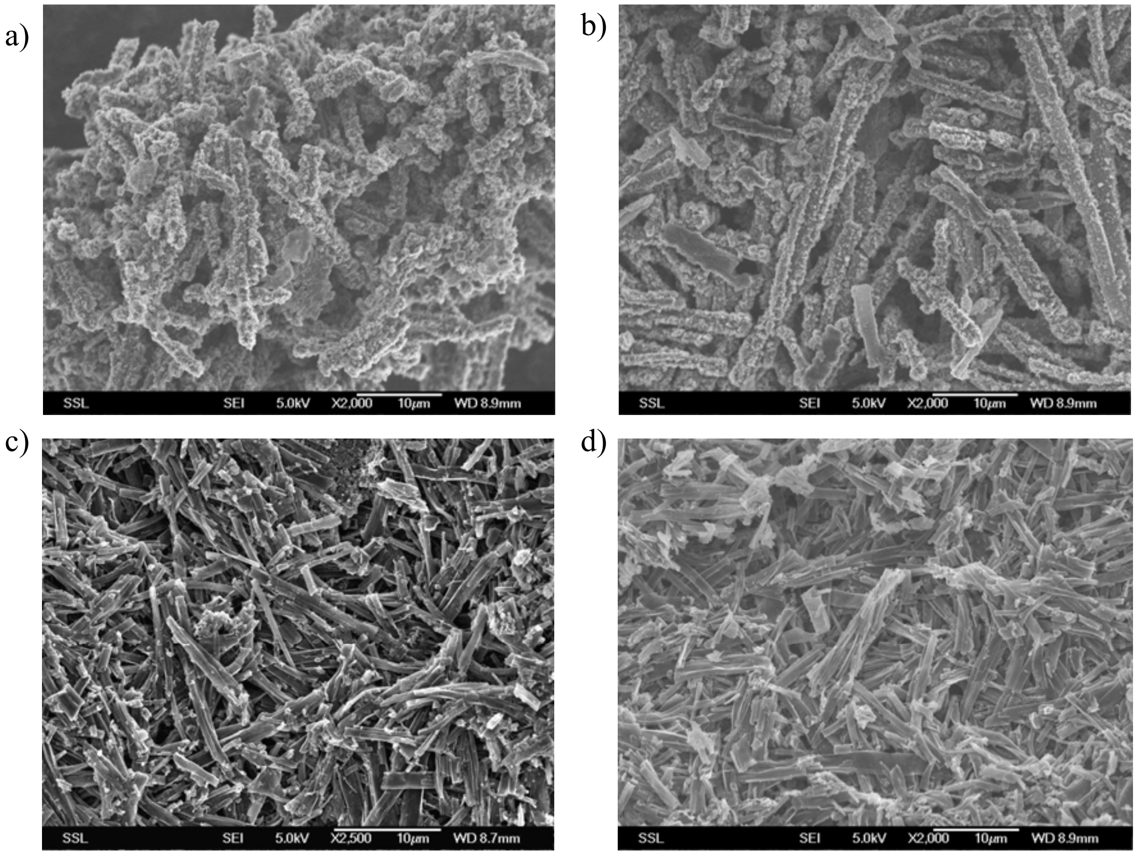


Fig. S2. SEM photos of PANI products at [An]/[AR8] value of (a) 50, (b) 25, (c) 15 and (d) 5 ([An] = 0.11 M, [An]:[APS] = 1:1, reaction time = 18 h, temperature = 2.5 ^{o}C).

SEM images show that the morphology of the PANI products changes with different molar ratio of aniline to AR8 (represented by [An]/[AR8]) at fixed aniline concentration ([An] =0.11 M). When [An]/[AR8] is 75, the PANI products obtained are very much similar to the PANI products obtained without any structural directing agent under the same conditions. The structure and morphology of the PANI product change significantly as the ratio is decreased. The core-shell AR8-PANI products are formed and decorated with grains of PANI on them when [An]/ [AR8] was at 50 (Fig. S2a) and 25 (Fig. S2b), respectively. The length of these core-shell AR8-PANI products is in the range of 5-15 μm and the diameter is between 1 to 2 μm. When the [An]/[AR8] was reached 15, most of PANI product are rectangular shaped structure with smooth surface. There are still some PANI grains are formed (Fig. S2c). When [An]/[AR8] was at the lowest value of 5, core-shell AR8-PANI products were still observed, but with the rods in aggregated and entangled form (Fig. S2d).

3. Effect of the aniline concentration on the morphology of the PANI products at fixed ratio ([An]/[AR8] = 10).

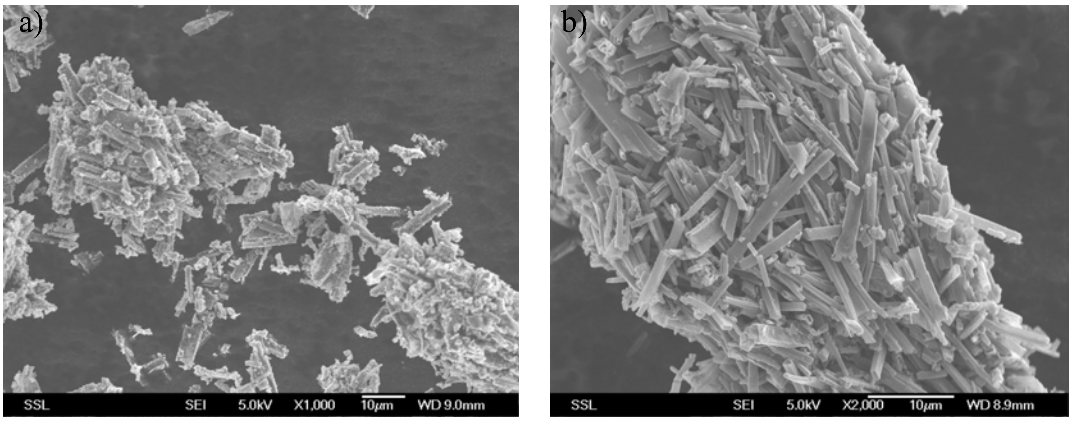


Fig. S3. SEM photos of PANI nanotubes at [An] value of (a) 0.05 M and (b) 0.16 M ([An]/[APS] = 1:1, reaction time = 18 h, temperature = 2.5 ^{o}C, [An]/[AR8] = 10).

Figure S3 shows the effect of the aniline concentration on the morphology of the PANI products at fixed ratio ([An]/[AR8] = 10). When the starting concentration of aniline was 0.056 M, the core-shell AR8-PANI products have blobs of PANI decorated on it (Fig. S3a). This is possibly due to the low concentration of aniline monomer, which resulted in less aniline absorbed on the templates. When the concentration of aniline was raised to 0.16 M, smooth core-shell AR8-PANI products of diameter ranging from 700 nm to 1000 nm were also produced (Fig. S3b).

4. Effect of temperature on the morphology of the PANI products

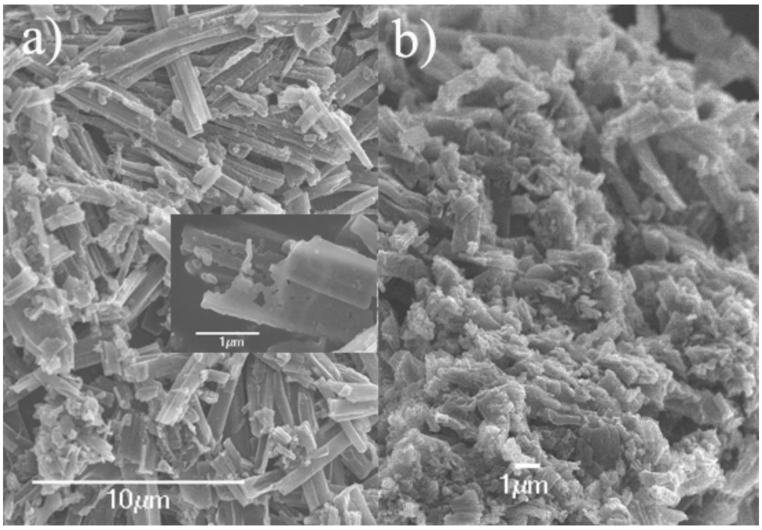


Figure S4. SEM images of PANI products prepared at different temperature (a) 7.5 ^{o}C and (b) 15 ^{o}C ([An] = 0.11 M, [An]:[APS] = 1:1, reaction time = 18 h, [An]:[AR8] = 10).

The PANI products were also prepared in a range of temperatures (Figure S4). At 7.5 ^{o}C, the rod-like PANI were still pretty much similar to those prepared at 2.5 ^{o}C, but some deformations were visible and there exist some short segments of tubes in the sample. At 15 ^{o}C, there were more short segments of tubes in the sample. Deformation of the tubes is also observed. This is expected since an increase in temperature would make the elongation process more difficult. The temperature might also play a part in the reaction kinetics which might affect the resultant morphology of PANI products.

5. FTIR spectrum of rectangular shaped core-shell AR8-PANI products after AR8 releasing.

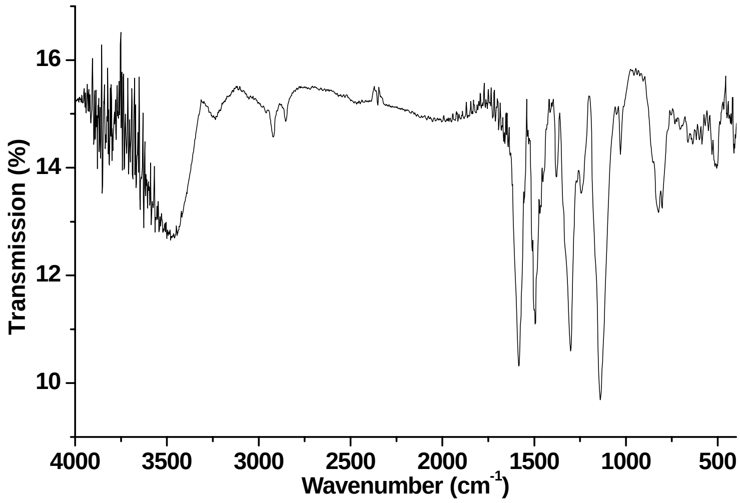


Figure S5. FTIR spectrum of rectangular shaped PANI tube.

6. UV-vis spectra of rectangular shaped core-shell AR8-PANI products before (a) and (b) after water washing.

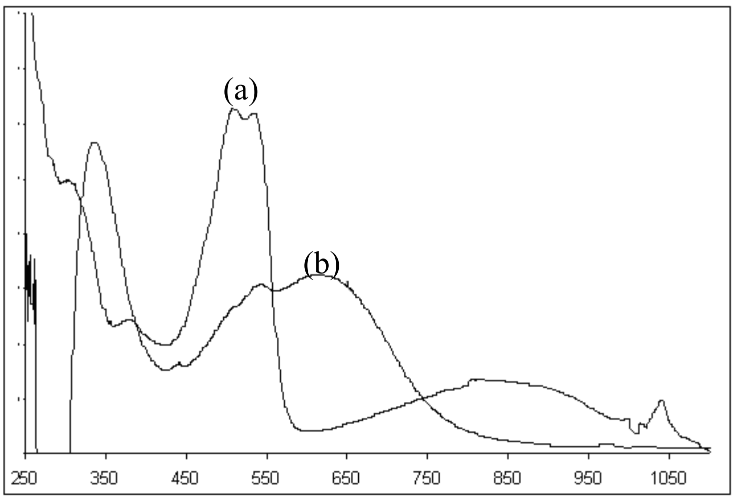


Figure S6. The UV-vis spectra of PANI-AR8 before (a) and (b) after water washing.

7. XRD of rectangular shaped core-shell AR8-PANI products after AR8 releasing and AR8.

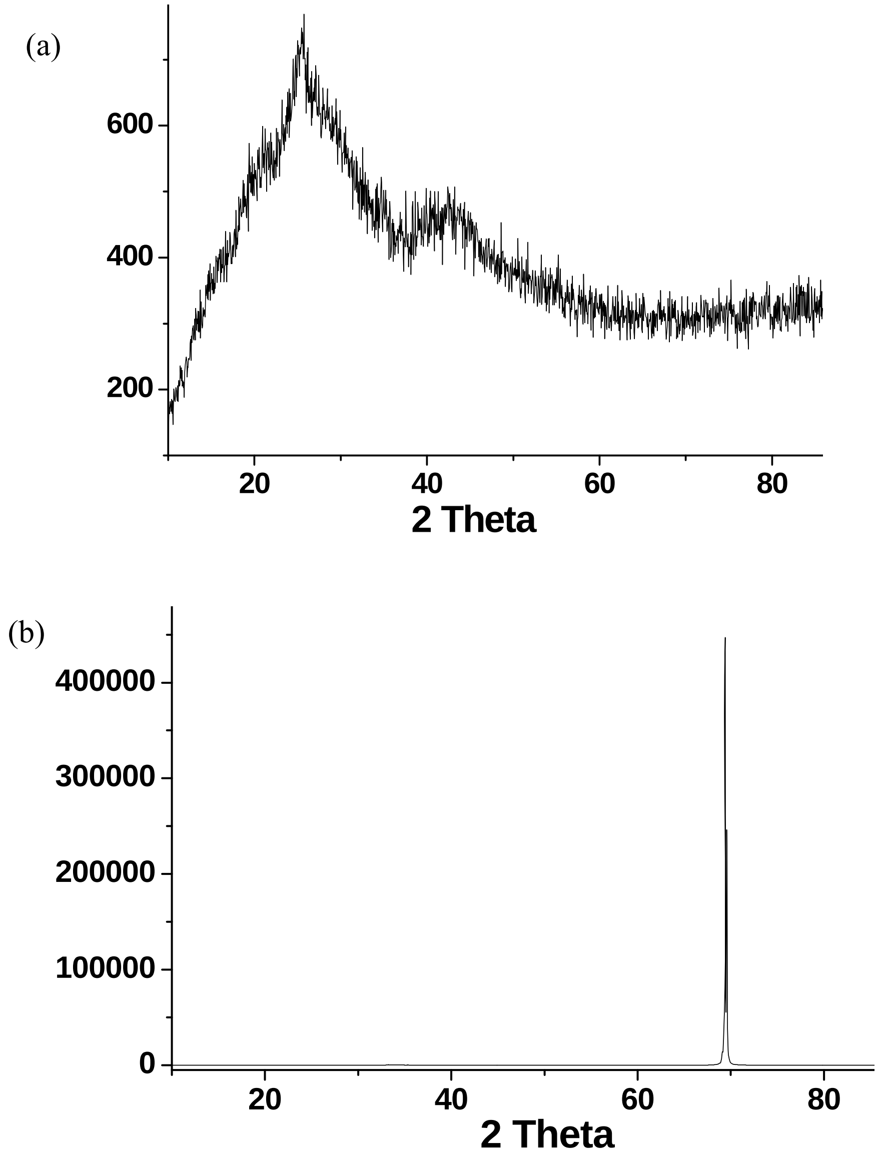


Figure S7. The X-ray diffraction pattern of (a) PANI-AR8 product and (b) AR8.