Supplementary Material (ESI) for Physical Chemistry Chemical Physics

Electronic Supplementary Information (ESI)

Detection of chemical vapors with tunable emission of binary organic nanobelts

Jian Yao Zheng, Chuang Zhang, Yong Sheng Zhao,* and Jiannian Yao*

Beijing National Laboratory for Molecular Sciences (BNLMS), Key Laboratory of Photochemistry, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China.

E-mail: jnyao@iccas.ac.cn; yszhao@iccas.ac.cn

Fax: +86-10-62652029; Tel: +86-10-62652029

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Experimental details

The preparation of PVP films were prepared by casting 200 μl dispersion of nanobelss in PVP aqueous solution on 2×2 cm^2 glass slides followed by the evaporation of the water. The concentration of the PVP aqueous solution used in the reprecipitating operation is 2 wt %.

The fluorescence spectra were measured on a Hitach F-4500 fluorospectrometer using a film sample hoder. The nanobelt films were prepared by dropcasting the aqueous dispersion of nanobelts onto the glass slides. The saturated vapor of HCl or NH_3 was obtained by sealing a small amount of aqueous solution with different concentration in a 50 ml jar, in which some cotton was used to cover the solution to maintain constant vapor pressure.[1] The fluorescence spectra of the nanobelts films were monitored before and after exposure to the saturated vapor of HCl or NH_3 introduced by a syringe from the sealed jar.[2,3] Before use the jar was sealed overnight to achieve constant, saturated vapor pressure inside.[1]

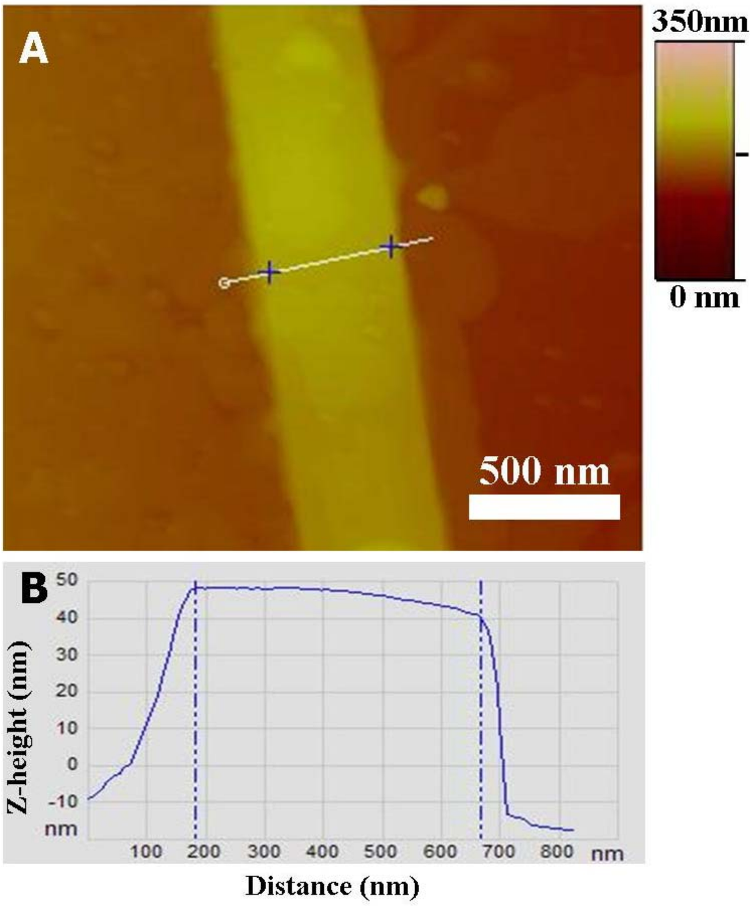

Fig. S1 (A) AFM image of a single binary DPA/NR nanobelt (the same sample shown in Fig. 2). (B) A line-scan profile (marked in A) reveals the the flat top of the nanobelt. The AFM sample was prepared by drop-casting the nanobelt suspension in water onto a cover glass.

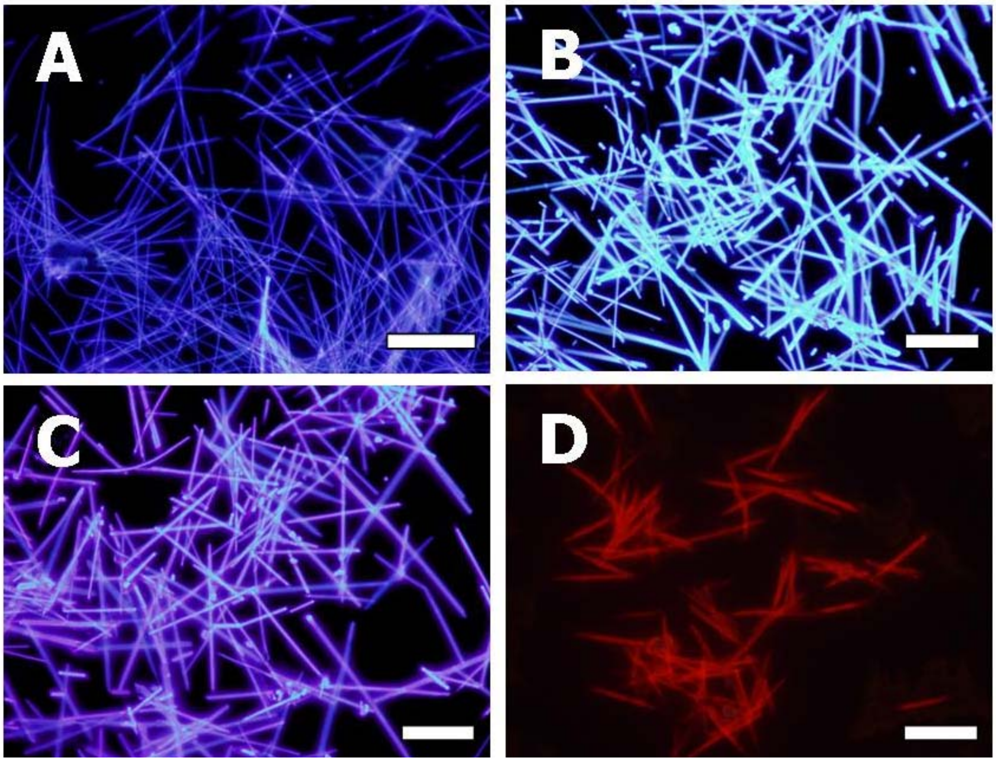

Fig. S2 Fluorescence microscopy images of the as-prepared nanobelts. The samples were excited using UV band (330-380 nm) of a mercury lamp. (A-D) The doping contents of NR are 0, 0.1%, 0.5% and 100% (molar), respectively. All scale bars are 20 um.

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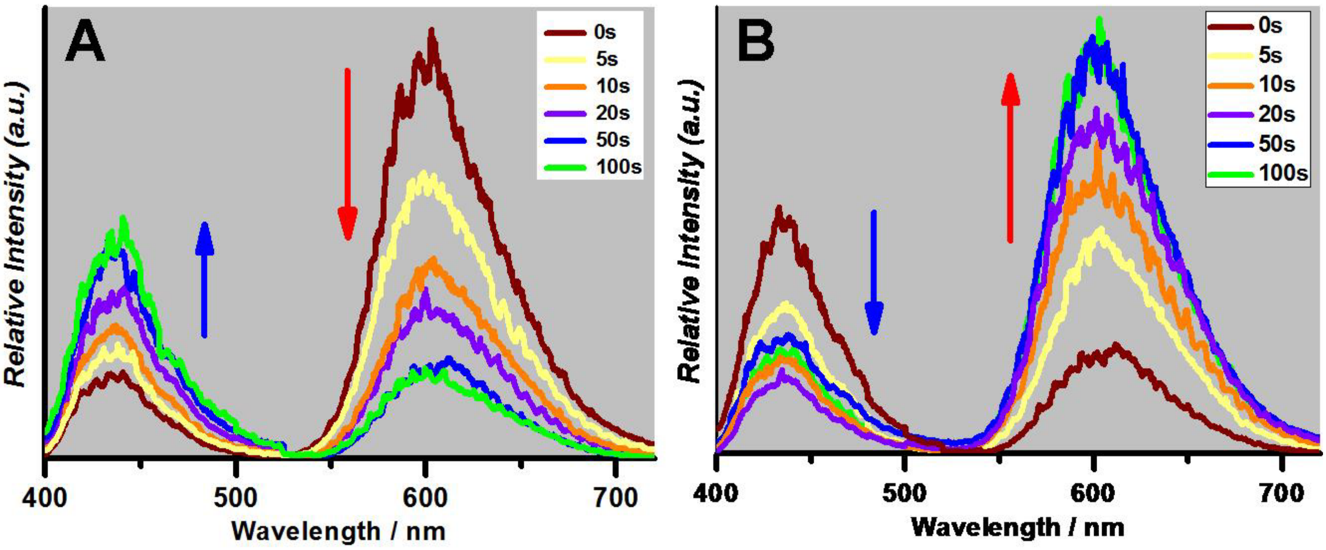


Fig. S3 (A, B) Time dependent PL spectra of the binary nanobelts with a DPA/NR molecular ratio of 200:1 on exposure to HCl vapor (ca. 15 ppm in air), followed by an exposure to NH_3 vapor (ca. 50 ppm in air).

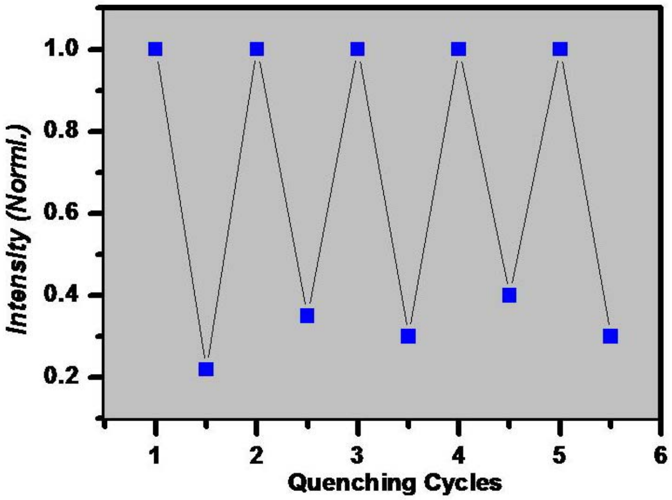


Fig. S4 Five continuous cycles of quenching-recovery measurement of a nanobelt film (PL intensity at 600 nm). The quenching was performed by exposing the film to a saturated vapor of HCl (ca. 15 ppm) for 100 s. After each cycle of quenching, the fluorescence of the film was recovered by exposing it to NH_3 (ca. 50 ppm) for 100 s. All emission intensities are normalized to the intensity of the pristine film before exposure to HCl.

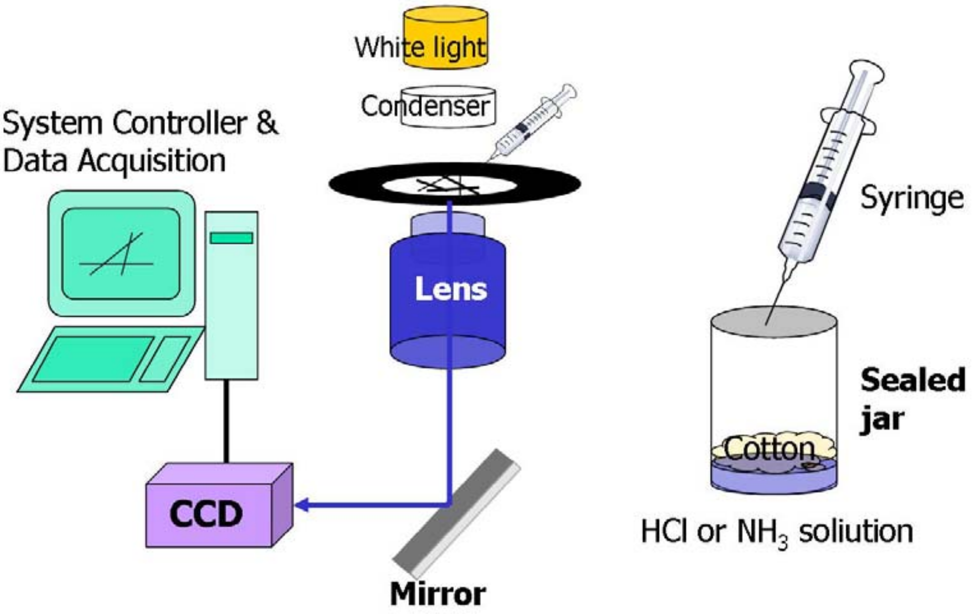


Fig. S5 The experimental set-up for fluorescence microscopy imaging. The nanobelt films were prepared by dropcasting the aqueous dispersion of nanobetls onto the glass slides. The vapor sensing measurements were carried out by introducing the saturated vapor of the HCl or NH_3 directly onto the nanobelts film by a syringe. The saturated vapor of HCl or NH_3 was obtained by sealing a small amount of aqueous solution in a 50 ml jar, in which some cotton was used to cover the solution to maintain constant vapor pressure. Before use the jar was sealed overnight to achieve constant, saturated vapor pressure inside.

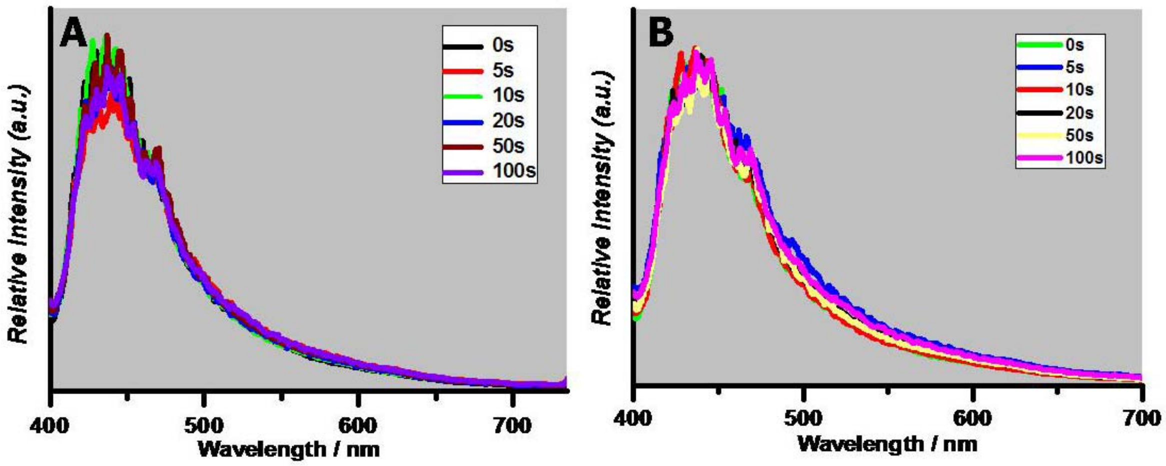
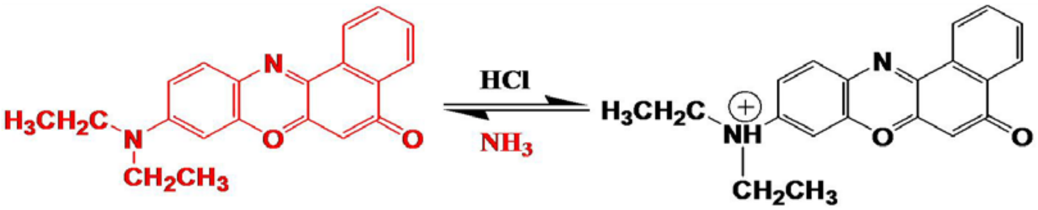


Fig. S6 Time dependent PL spectra of the undoped DPA nanobelts on exposure to the (A) HCl vapor (ca. 15 ppm in air) and (B) NH_3 vapor (ca. 50 ppm in air).



Scheme S1 Protonation and de-protonation of the diethylamino groups in NR on exposure to HCl and NH_3 vapor, respectively.

Notes and references

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3 E. P. Perman, *J. Chem. Soc.*, 1901, **79**, 718.