

Multiconfigurable Logic Gates Operation in 1D Polydiacetylene Microtubes Waveguide

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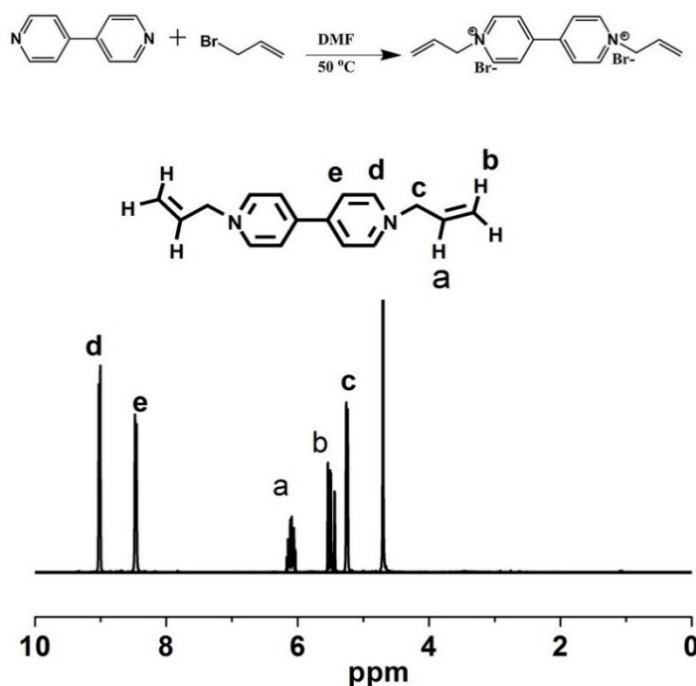


Figure S1. The synthesis route, molecular structure and the ^1H NMR spectra (D_2O , 400 MHz, 25°C) of N,N'-diallyl-4,4'-bipyridinium.

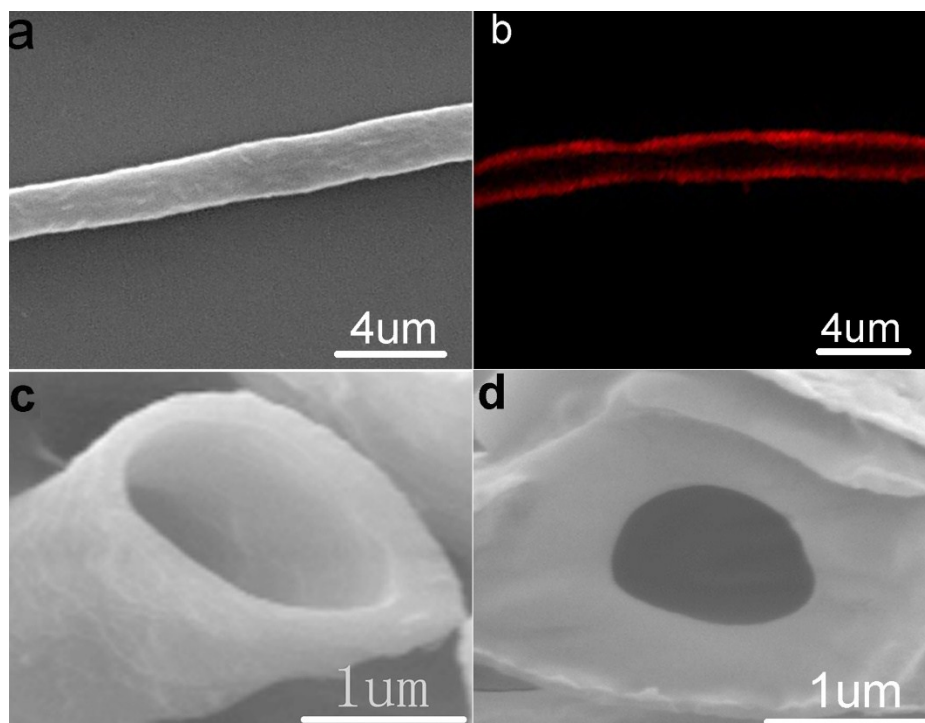


Figure S2. (a) SEM characterization and (b) Laser Confocal Microscopy characterization and (c) (d) Cross-sectional SEM image of the broken PDA microtube.

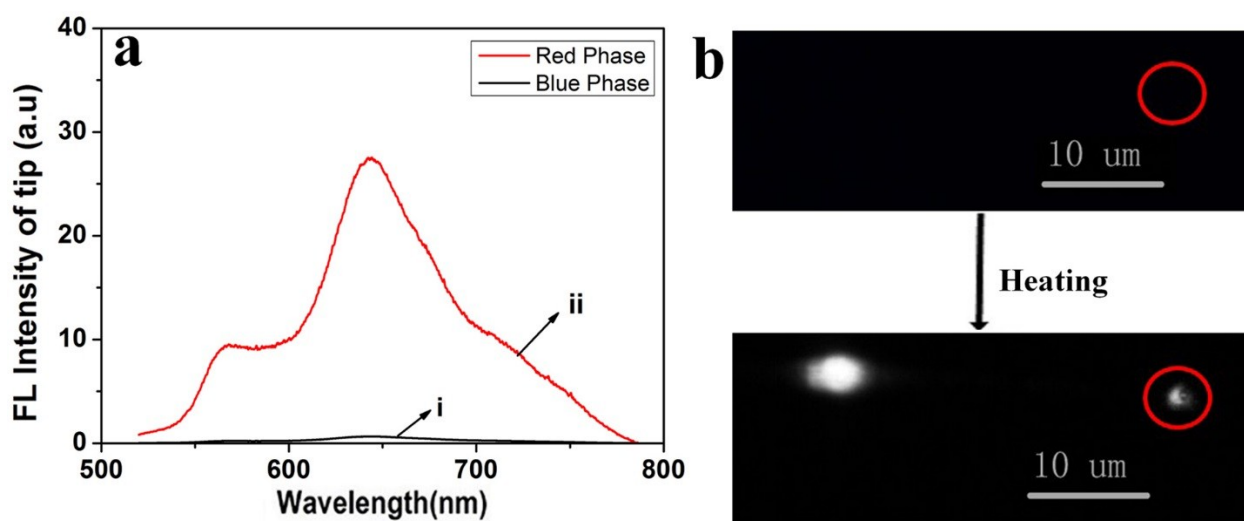


Figure S3. (a) Tip emission spectra of single VFPDA microtube (i) before heating treatment; (ii) upon heating treatment for 10 min. (b) FL microscope images collected upon excitation of the same VFPDA microtube with the heating treatment.

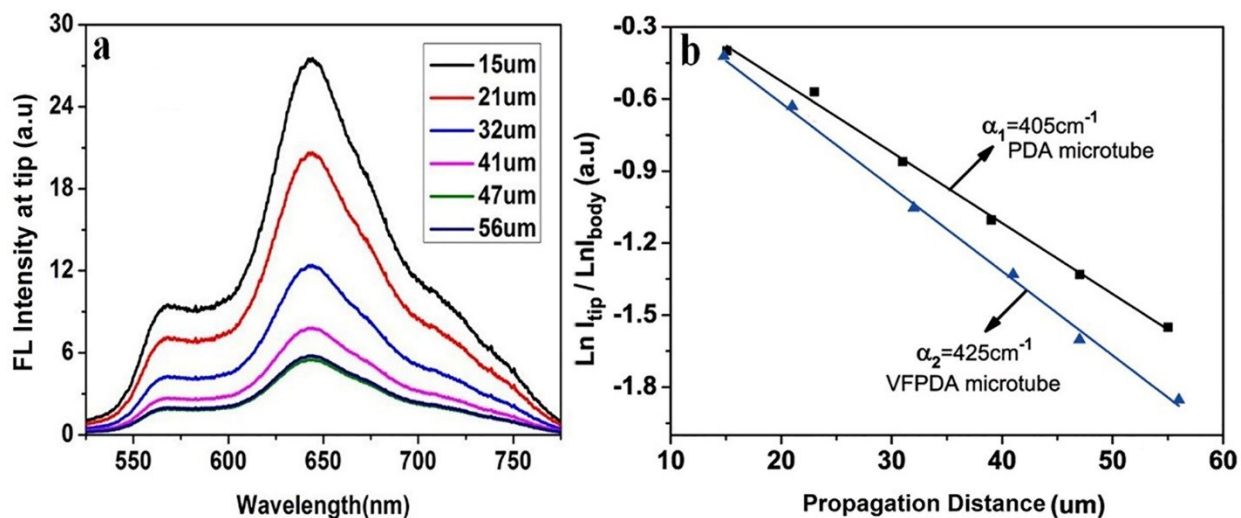


Figure S4. (a) Tip emission spectra of VFPDA microtube at different propagation distances. (b) Logarithmic plots of relative PL intensities of pure PDA and VFPDA microtubes against propagation distance.

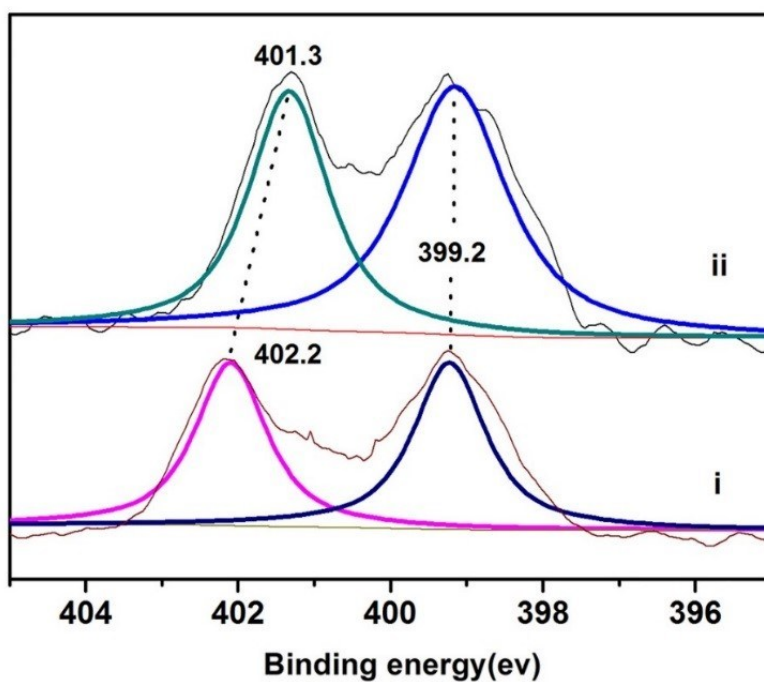


Figure S5. X-ray photoelectron spectra of N 1s of viologen units modified on the surface of VFPDA with the applying voltage of (i) 1.5v and (ii) -1.5v.

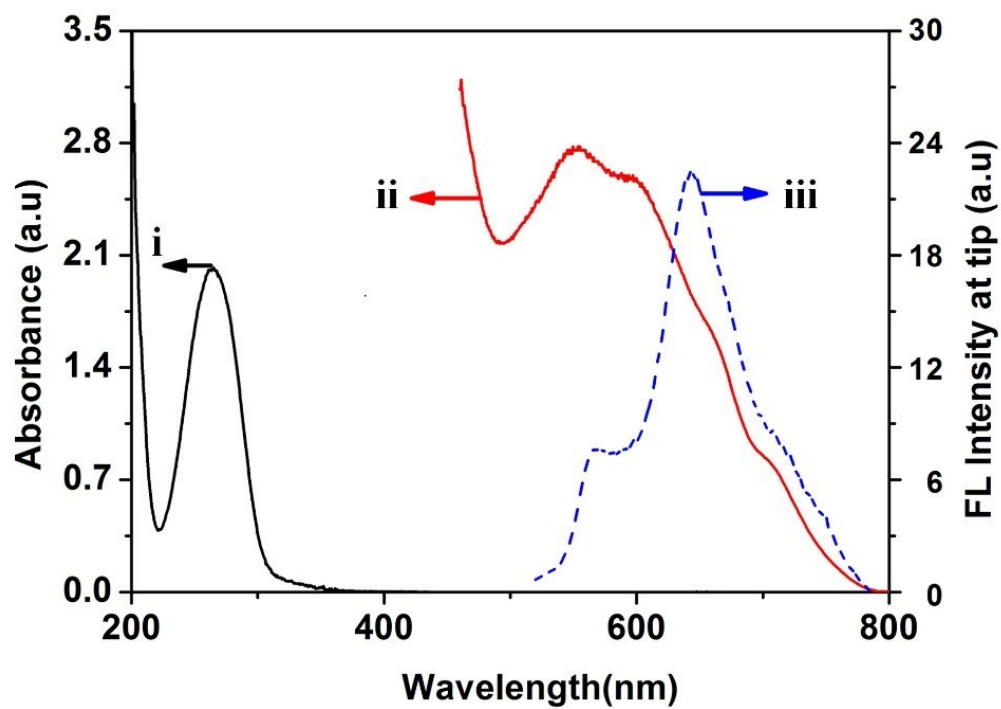


Figure S6. UV-Vis absorption spectra of N,N'-diallyl-4,4'-bipyridinium (curve i: applying voltage of 1.5 V, curve ii: under a applying voltage of -1.5 V), and the PL (curve iii) spectra of single VFPDA microtube upon excitation at 532 nm laser.

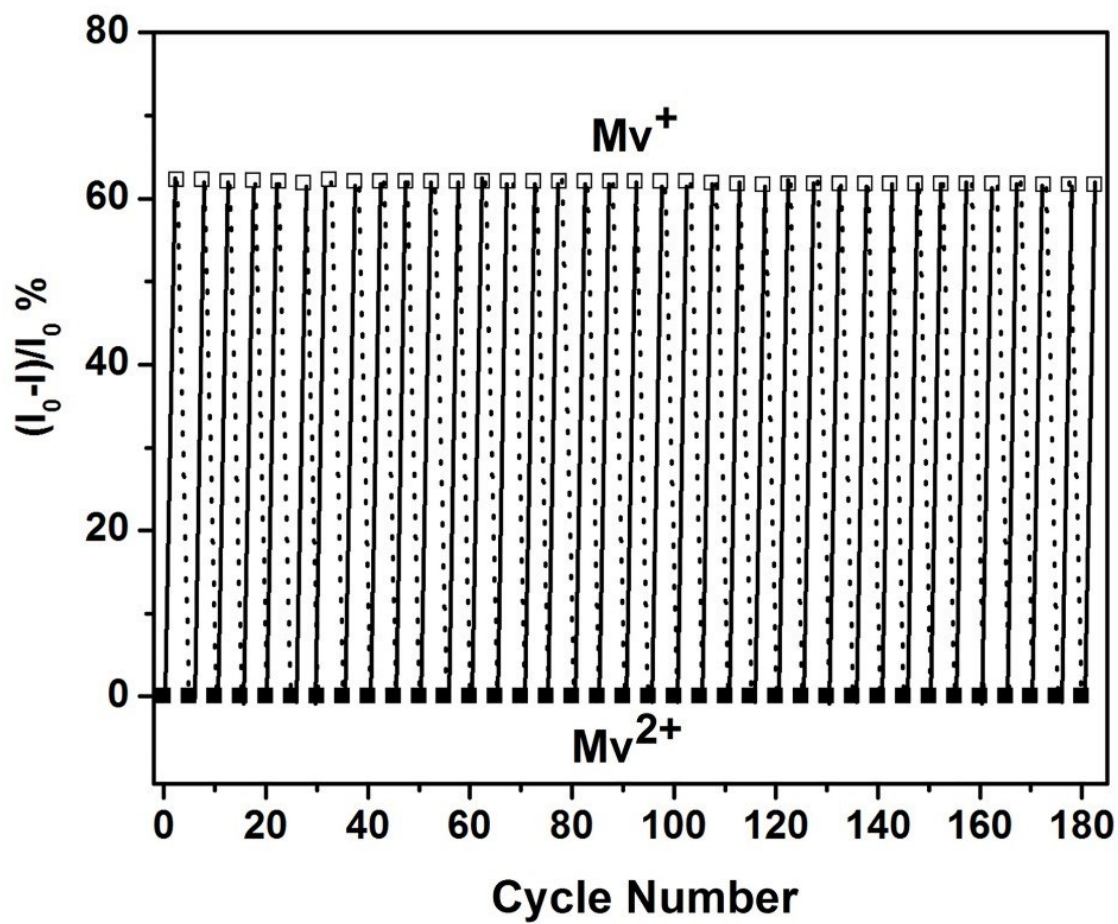


Figure S7. Reversible fluorescence on-off cycles of the VFPDA microtube at tip emission under an alternating applied potential with 1.5V (■ Mv^{2+}) and -1.5V(□ Mv^+).

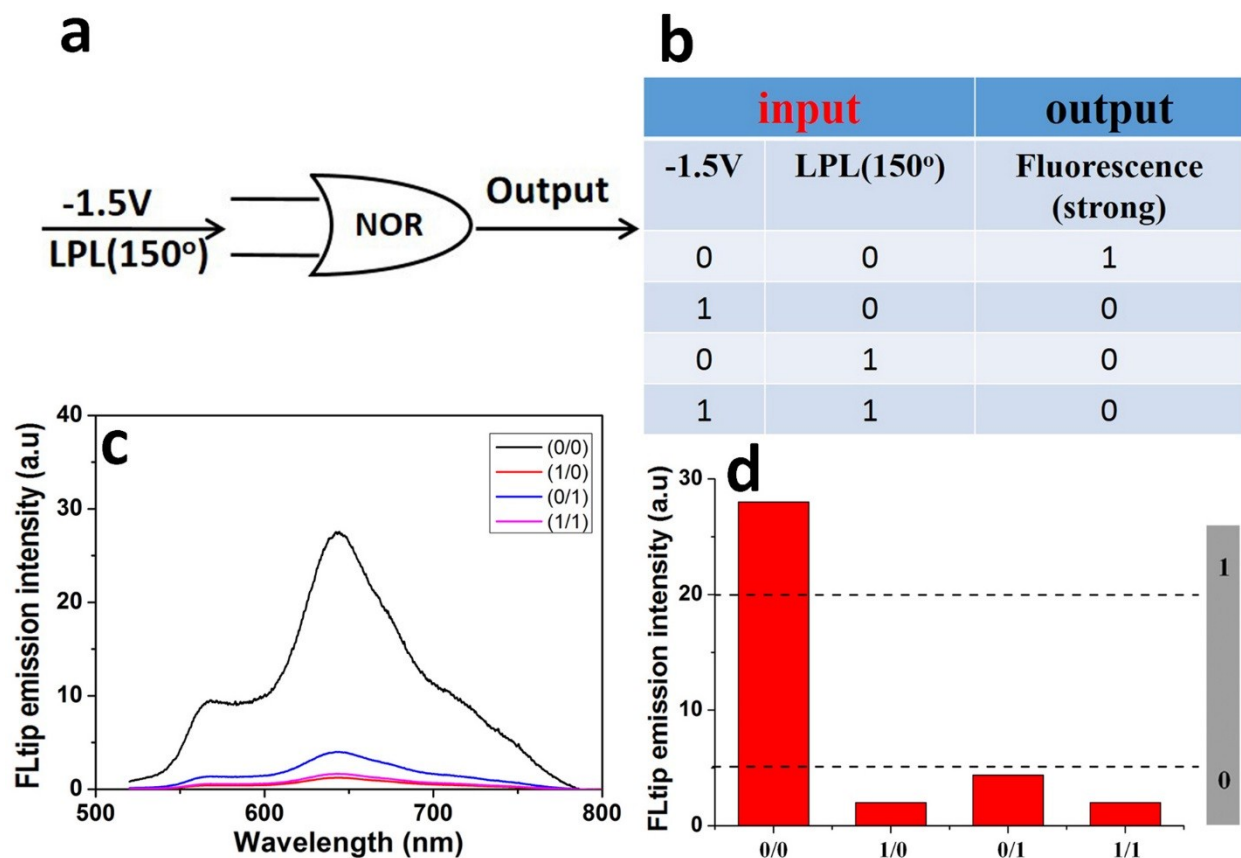


Figure S8. (a) Scheme of the design strategy for NOR logic based on the VFPDA microtube. (b) Truth table for the NOR gate. (c) Tip emission spectra of single VFPDA microtube of NOR gate with different combinations of the inputs upon excitation at 532 nm. (d) The fluorescence intensities of tip emission for the NOR logic gate.

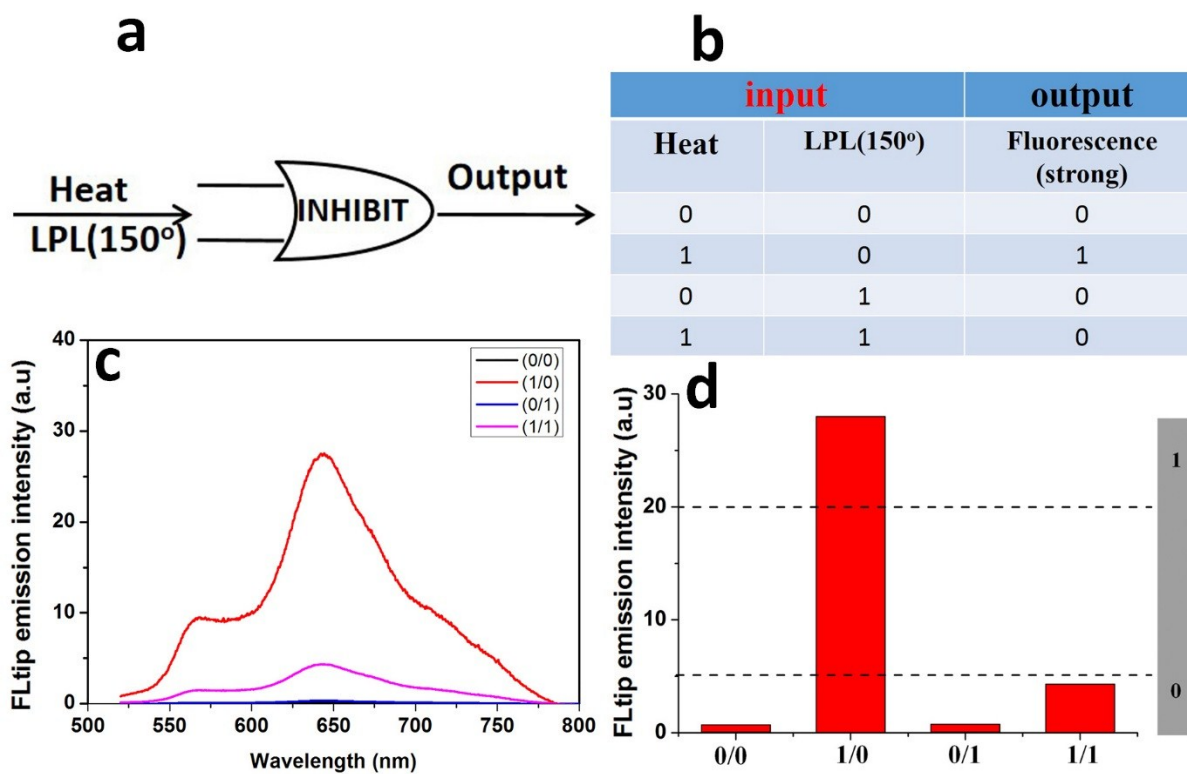


Figure S9. (a) Scheme of the design strategy for INHIBIT logic based on the VFPDA microtube. (b) Truth table for the INHIBIT gate. (c) Tip emission spectra of single VFPDA microtube of INHIBIT gate with different combinations of the inputs upon excitation at 532 nm. (d) The fluorescence intensities of tip emission for the INHIBIT logic gate.

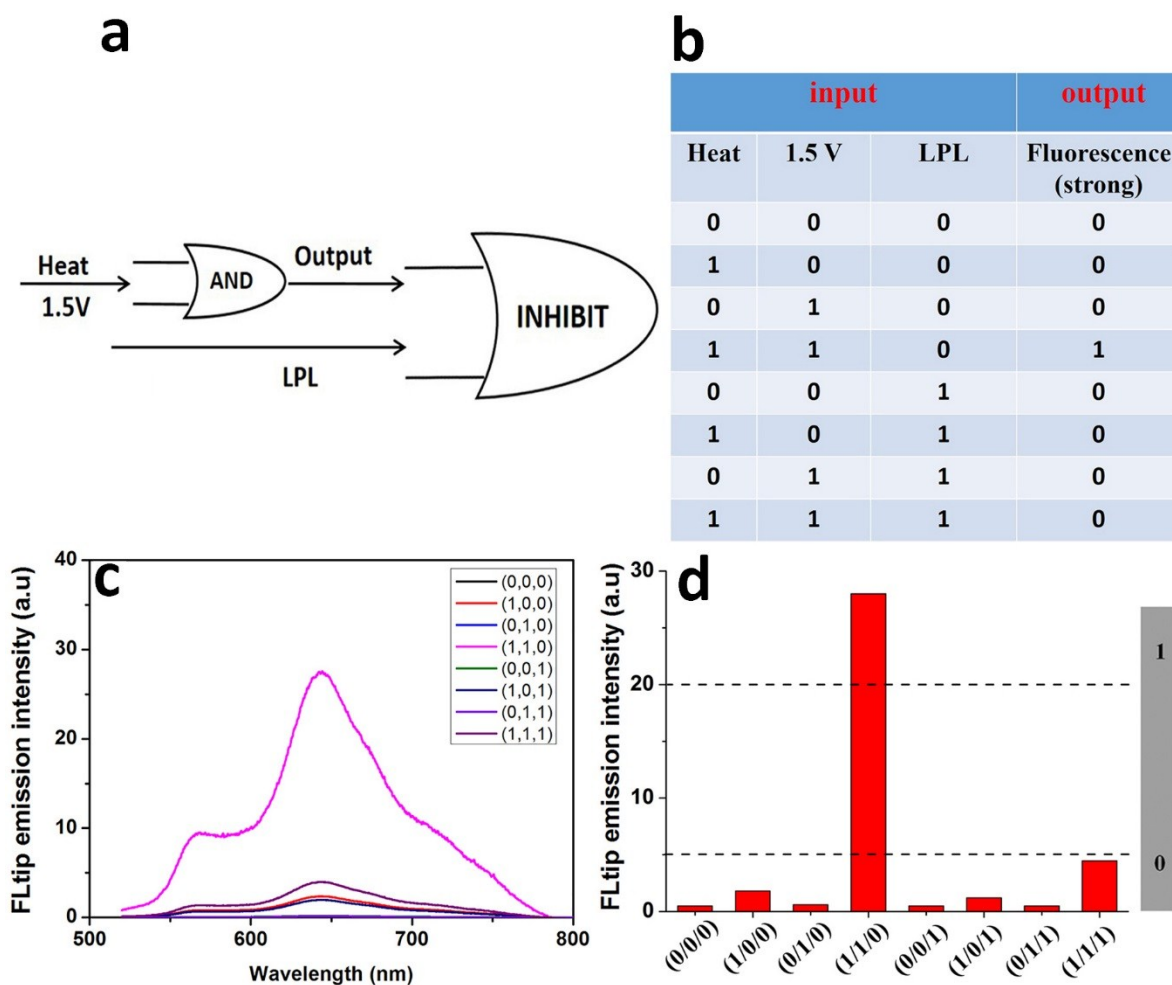


Figure S10. (a) Scheme of the 3-input logic gates (AND-INHIBIT) based on the VFPDA microtube. (b) Truth table for the AND-INHIBIT gate. (c) Tip emission spectra of single VFPDA microtube of AND-INHIBIT gate with different combinations of the inputs upon excitation at 532 nm. (d) The fluorescence intensities of tip emission for the AND-INHIBIT logic gate.