Supporting Information

Up-conversion Luminescent Switch Based on Photochromic Diarylethene and Rare Earth Nanophosphors

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General experiment

Sizes and morphologies of LaF_3: Yb, Ho were determined at 200 kV using a JEOL JEM-2010F high-resolution transmission electron microscope (HR-TEM). X-ray diffraction (XRD) measurements were carried out on a Bruker D4 X-ray diffractometer using Cu Kα radiation (λ = 0.15418 nm). Photochromic reactions were done on a CHF-XM-500W system (Beijing, China) with a 500W Xe lamp as the light source. 340 and 560 nm monochromic light were obtained by band-pass filters with the half width of 10 nm (Omega). UV-Vis spectra were recorded on a Shimadzu UV-2250 spectrophotometer. Luminescence spectra were measured with an Edinburgh FLS-920 fluorescence spectrometer.

Up-conversion luminescence spectra were obtained using an external 0-800 mW adjustable continuous wave laser (980 nm, Beijing Hi-Tech Optoelectronic Co., China) as the excitation source instead of the Xenon source in the spectrophotometer. Confocal fluorescence imaging was performed with an Olympus IX81 laser scanning microscopy excited by 980 nm laser. Emission was collected from 500 to 600 nm.

The thin films were prepared by spin-coating the $CHCl_3$ solution of LaF_3: Yb, Ho, **1** and PMMA mixture onto glass substrates at a spin rate of 1000 rpm for 30 s. The concentration of LaF_3: Yb, Ho and PMMA was fixed (2 mg / mL, 10 mg / mL, respectively). The concentration of DTE was from 0 to 8 mg / mL.

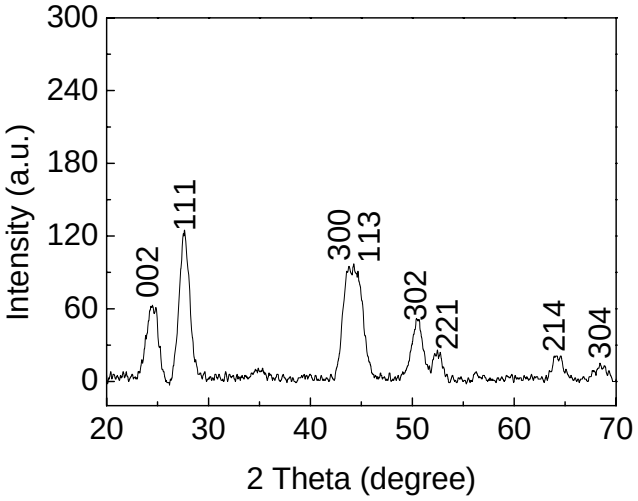

Figure S1 XRD pattern of LaF_3: Yb, Ho nanphosphors

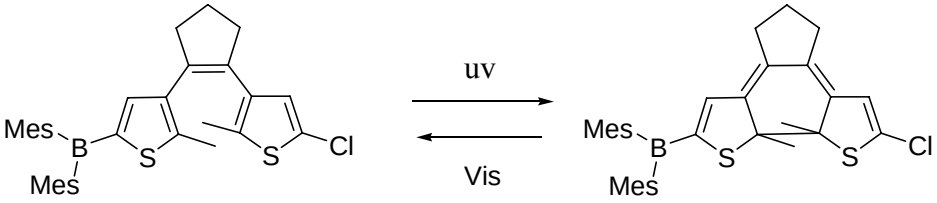

Figure S2 Closing and opening process of compound **1**