Supporting information

A simple fluorescent switch with four states based on benzothiazole-spiropyran for reversible multicolor display and anti-counterfeiting

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Table of contents

1. NMR and LC-HMRS spectra of SP-OX-HBT and its isomers

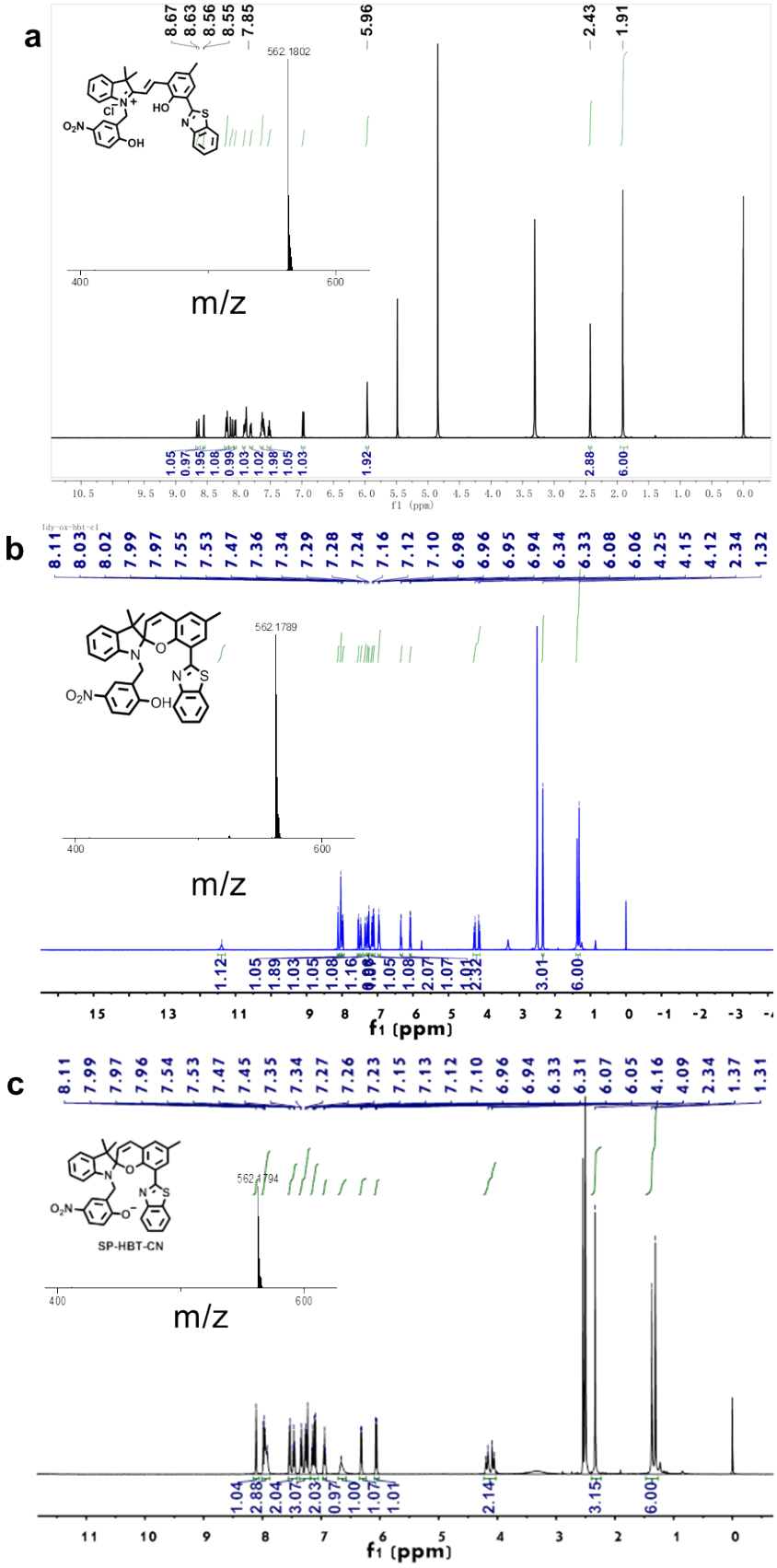

Figure S1 The ^{1}H NMR spectra and LC-HMRS of (a) SP-OX-HBT in CD_3OD (b) SP-OX-HBT

with equivalent base in DMSO and (c) SP-OX-HBT with excess base in DMSO.

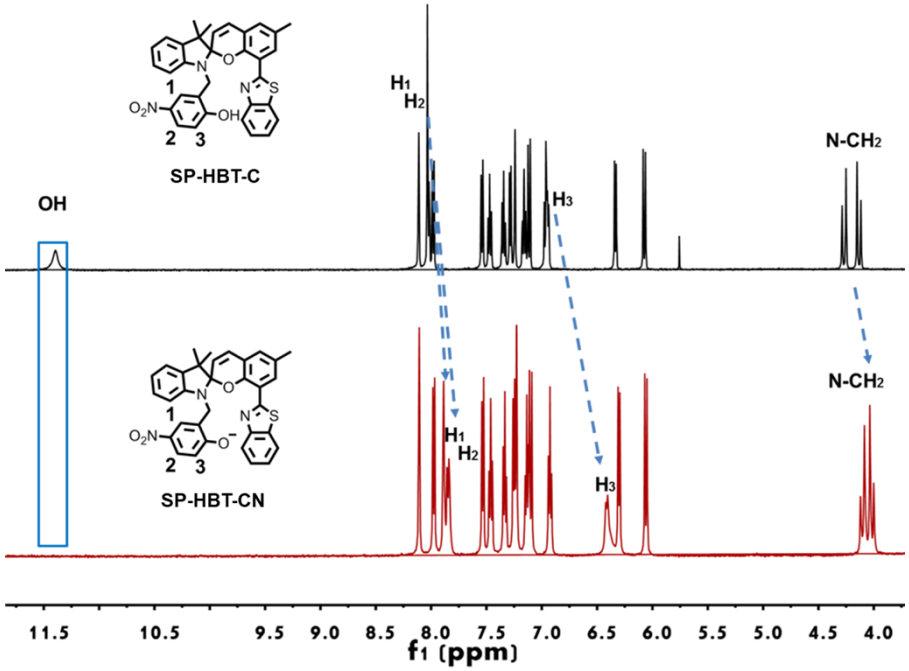

Figure S2 The partial ^{1}H NMR spectra of SP-HBT-C and SP-HBT-CN in DMSO-d6.
It is clearly shown that methylene and hydrogens nearing the non-conjugated nitrophenol are shifted to the high field in ^{1}H-NMR spectrum of SP-HBT-CN. At the same time, the disappearance of the OH peak of SP-HBT-CN molecule also indicates the formation of phenol anion.

2. Absorption spectra of SP-OX-HBT and its isomers in solution

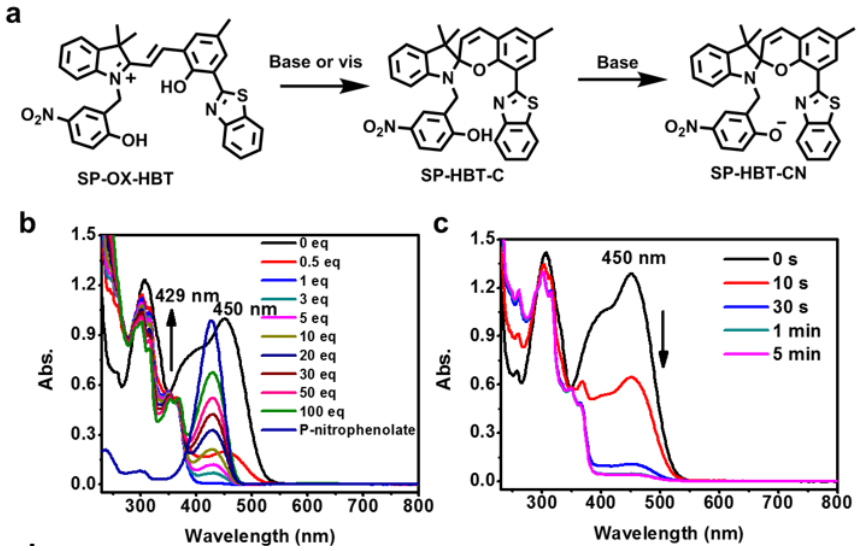

Figure S3 (a) The transformation of SP-OX-HBT upon base or visible light irradiation. (b) The absorption spectra of SP-OX-HBT with different equivalent base in CH_3CN solution. (c) The absorption spectra of SP-OX-HBT upon visible light irradiation with different time in CH_3CN

solution.

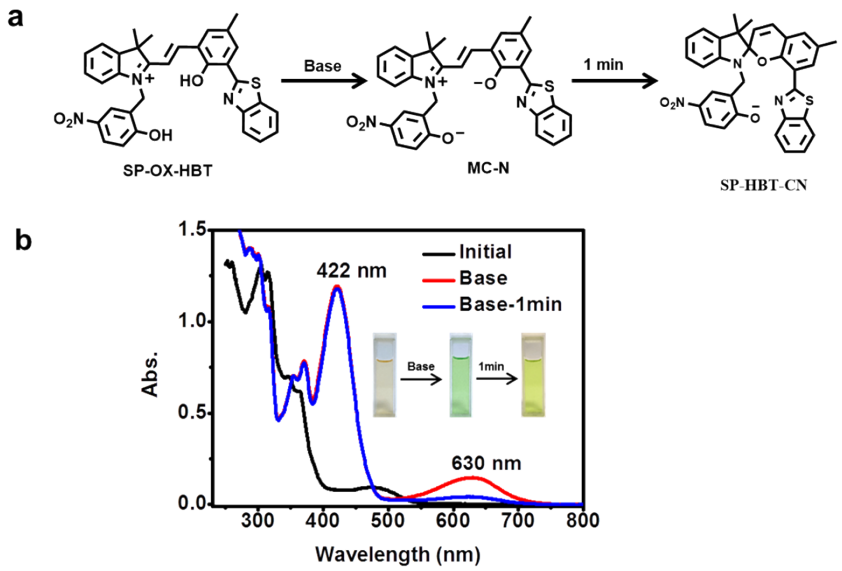

Figure S4 (a) The transformation of SP-HBT-C stimulated by alkali. (b) UV-Vis absorption spectra of SP-HBT-C without, with addition of t-BuONa immediately and equilibrium for 1 min in CH_2Cl_2 solution and corresponding photographs.

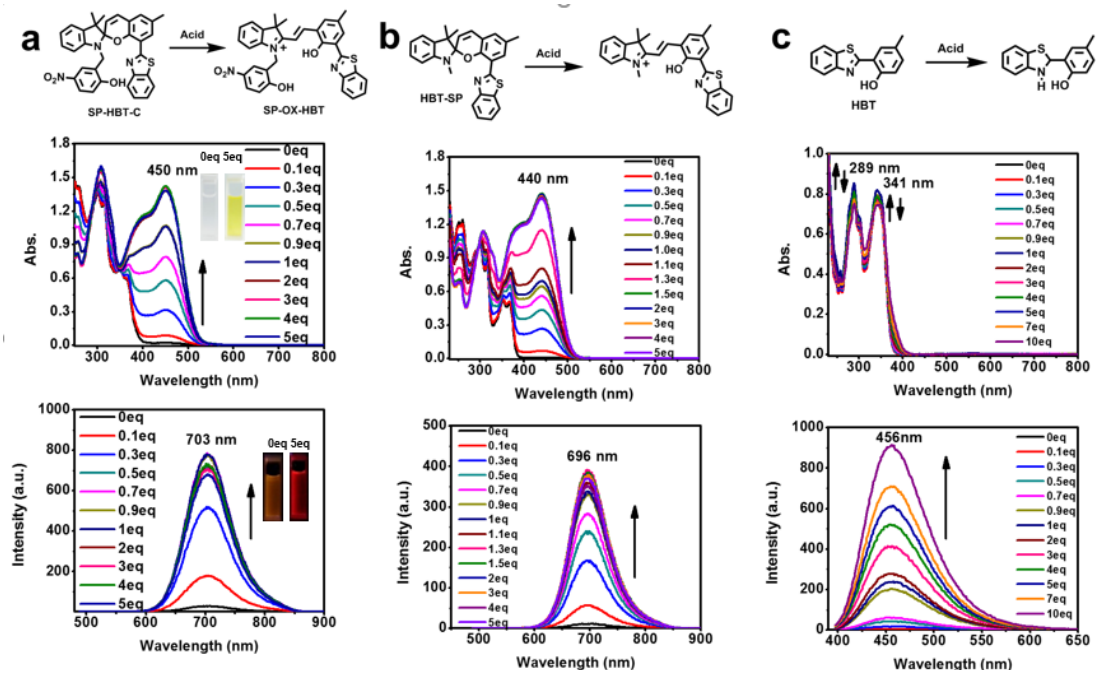

Figure S5 The structural transformation, UV-Vis absorption spectra and fluorescence spectra of (a)

SP-HBT-C, (b) SP-HBT, (c) HBT with different equivalent methanesulfonic acid in CH_3CN solution.

3. Absorption, emission spectra and corresponding pictures of the solid powder

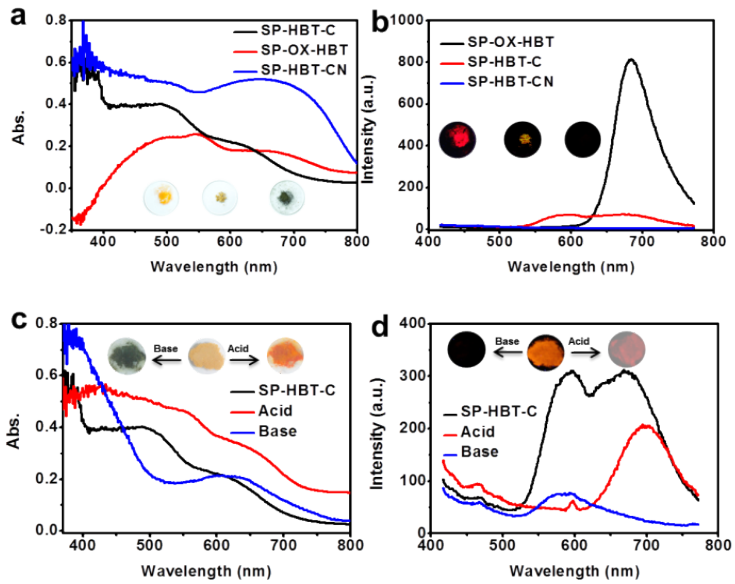

Figure S6 Pictures of solid powders in various states under visible light and 365 nm UV lamp and their corresponding (a) UV-Vis absorption spectra and (b) fluorescence spectra; (c) the UV-Vis absorption spectra of SP-HBT-C before and after acid/base stimulation; (d) the fluorescence spectra of SP-HBT-C before and after acid/base stimulation.

4. Illustration of the structure of paper

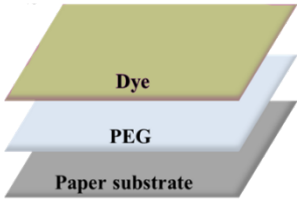

Figure S7 Illustration of the three-layer structure of rewritable paper based on the SP-HBT-C.