

Supplementary Figures

Reversible colour changes of binary films composed of azobenzene-based amorphous molecular materials and *p*-toluene sulfonic acid in response to exhaled breath

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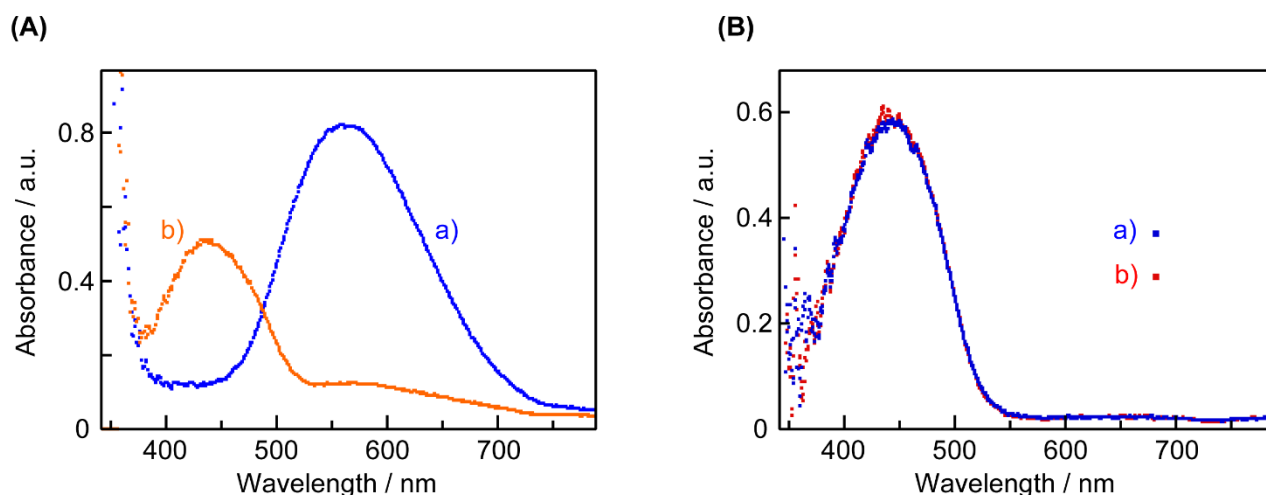


Fig. S1. Electronic absorption spectral changes of (A) PBAB-TsOH film and (B) BMAB film without TsOH. (a) at ambient atmosphere. (b) when breathing onto the film.

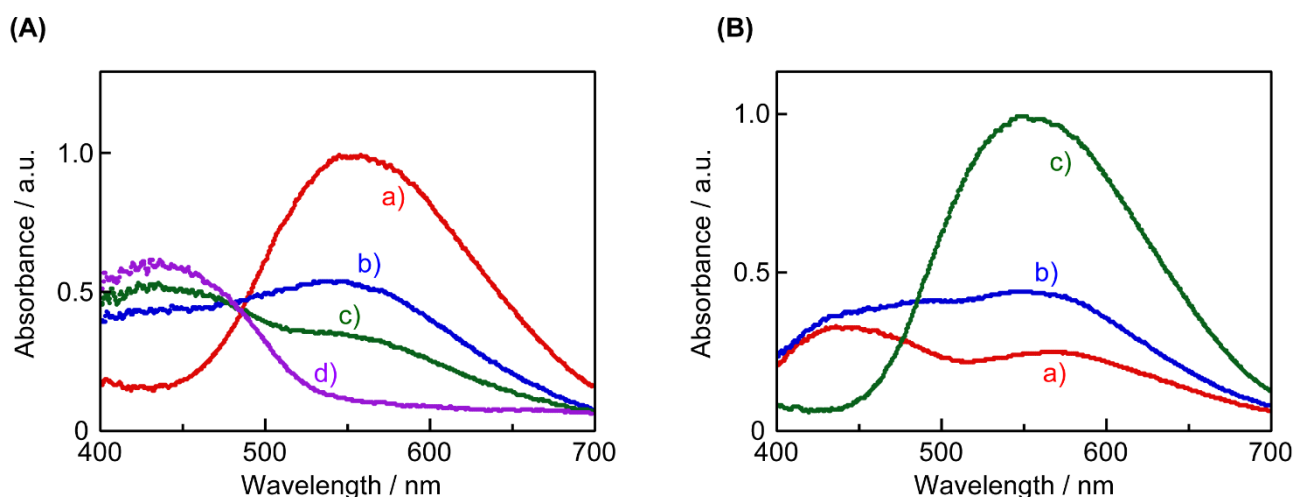


Fig. S2. (A) Electronic absorption spectra of BMAB-TsOH film at a variety of relative humidity (RH). RH = (a) ca. 40%, (b) ca. 50%, (c) ca. 60%, (d) ca. 70%. (B) Electronic absorption spectra of the binary films of BMAB and TsOH with molar ratios of (a) ca. 1:0.5, (b) ca. 1:1, and (c) ca. 1:2.

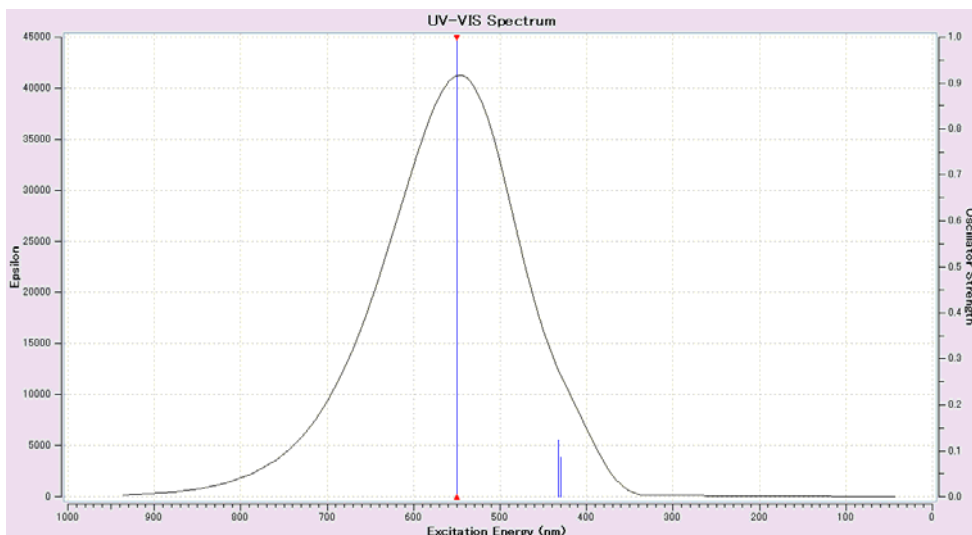
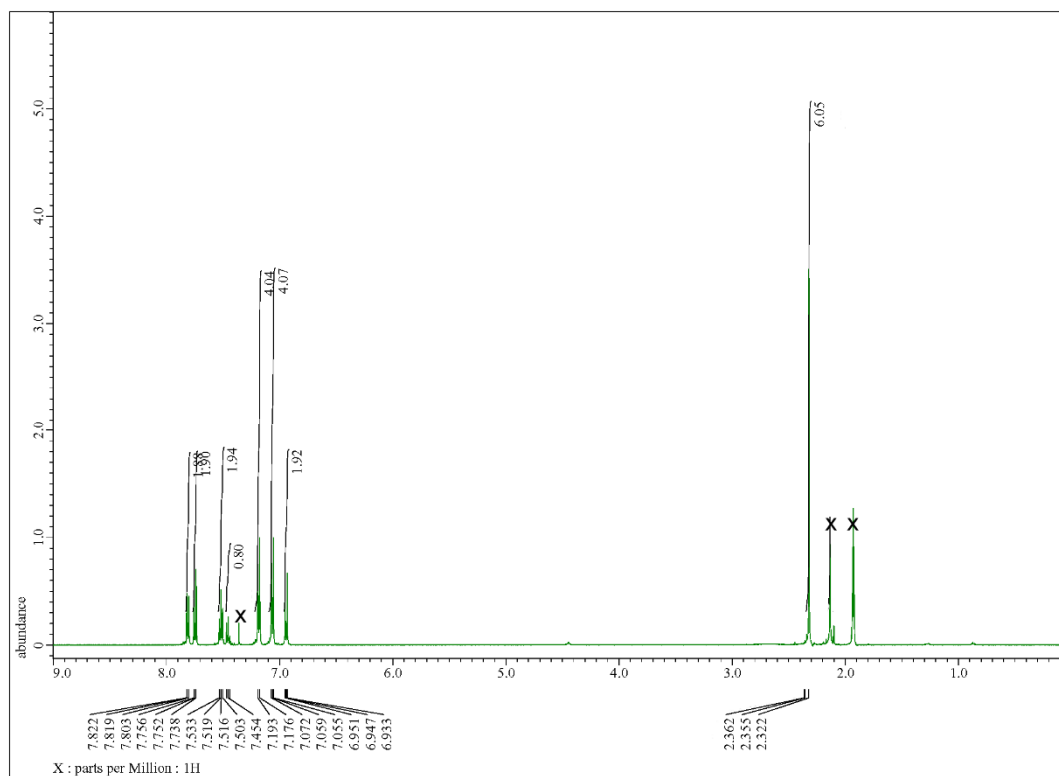


Fig. S3. Electronic absorption spectrum of BMAB-H⁺ predicted by ab initio calculation based on density-function theory at B3LYP/6-31G(d,p) level performed with the Gaussian 09.

(a)



(Fig. S4. Continued to next page.)

1H NMR spectrum (400 MHz, CDCl₃) of compound 10. The spectrum shows several peaks with the following chemical shifts (ppm): 7.946, 7.927, 7.844, 7.705, 7.688, 7.538, 7.358, 7.342, 7.293, 7.276, 7.256, 7.240, 4.821, 2.394, 2.378, and 1.99. Integration values are provided for the peaks: 7.946, 7.927, 7.844, 7.705, 7.688, 7.538, 7.358, 7.342, 7.293, 7.276, 7.256, 7.240, 4.00, 2.16, 11.98, 19.99, 2.394, and 2.378. A small peak at 2.0 ppm is marked with an 'X'.

abundance

7.0
6.0
5.0
4.0
3.0
2.0
1.0
0

9.0 8.0 7.0 6.0 5.0 4.0 3.0 2.0 1.0

1.75
7.10
0.90
2.05
11.46
4.00
1.97

16.00
17.40

X

3.226
2.338
2.316

7.8141
7.8001
7.7988
7.7777
7.7559
7.6332
7.6238
7.6119
7.6115
7.5115
7.4999
7.2226
7.2111
7.1980
7.0884
7.0711
7.0668
6.9277
6.9009

X : parts per Million : 1H

Fig. S4. ^1H NMR spectra for BMAB-TsOH- D_2O system in CD_3CN . (a) BMAB. (b) BMAB-TsOH $\cdot\text{H}_2\text{O}$ ([TsOH]/[BMAB] = ca. 4). (c) After addition of excess D_2O into the solution of BMAB-TsOH $\cdot\text{H}_2\text{O}$.