*Electronic Supplementary Information (ESI) for*

# Multifunctional Helical Cu(I) Coordination Polymer with Mechanochromic, Sensing and Photocatalytic Properties

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*Experimental Section*

**Photocatalytic experiments:** The evaluation of photocatalytic activities of the samples for the photocatalytic decolorization of organic dyes was performed at ambient temperature (25℃). The procedure was as follows: 0.030 g of sample was dispersed into 10mL of methyl blue aqueous solution (18.6735mg $L^{-1}$), followed by the addition of five drops of hydrogen peroxide solution ($H_2O_2$ 30%). A 500 W xenon arc lamp was used as a light source. Visible light then irradiated the above solutions. During the degradation, the mixture was stirred continuously by means of a magnetic stirrer. The samples were withdrawn regularly from the reactor, and dispersed powders were removed by centrifugation. At different time intervals, analytical samples were withdrawn and analyzed by UV/Vis spectroscopy. The degradation of MO and RhB were prepared using the method similar to that of MB except replacing MB solvent with MO aqueous solution (18.6735mg $L^{-1}$) and RhB aqueous solution (18.6735mg $L^{-1}$).

The band gap sizes of polymer were investigated by UV-vis diffuse reflection measurement method at room temperature. The $\alpha h\nu^2$ vs $h\nu$ curves for products are shown in Figure S4. According to the equation $\alpha h\nu^2 = K(h\nu - Eg)^{1/2}$ (where $\alpha$ is the absorption coefficient, $h\nu$ is the discrete photo energy, K is a constant, and Eg is the band gap energy), the extrapolated value (the straight lines to the x axis) of $h\nu$ at $\alpha = 0$ give absorption edge energies corresponding to Eg = 2.49eV for the compound.[1, 2]

References:

[1] S. Tsunekawa, T. Fukuda, A. Kasuya, J. Appl. Phys. 2000 , 87, 1318.
[2] A. L. Linsebigler, G. Q. LU, J. T. Yates, Chem. Rev. 1995 , 95, 735.

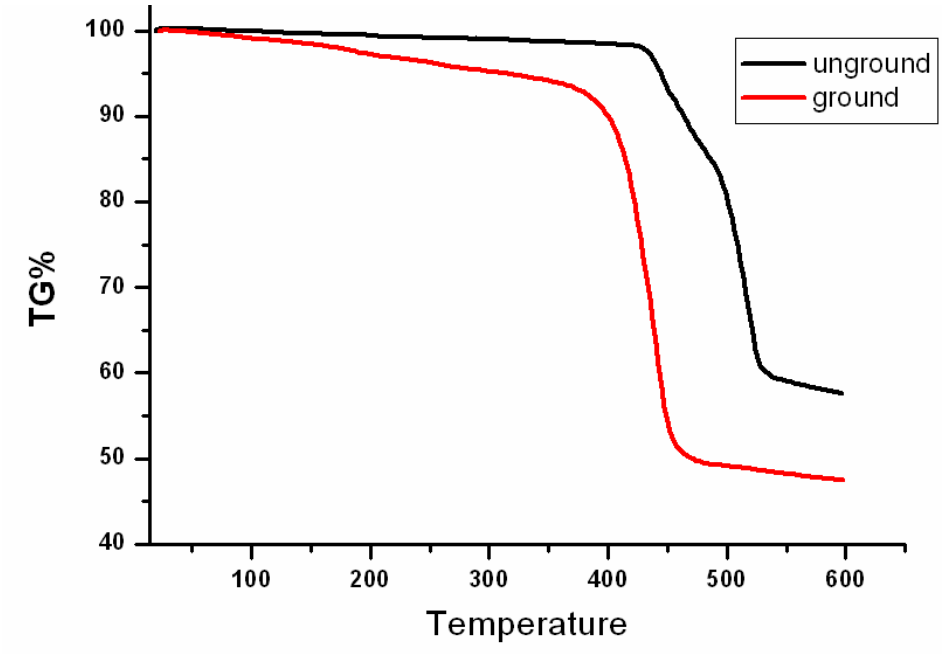


**Fig. S1** Thermogravimetric analyses of **1** and its ground sample.

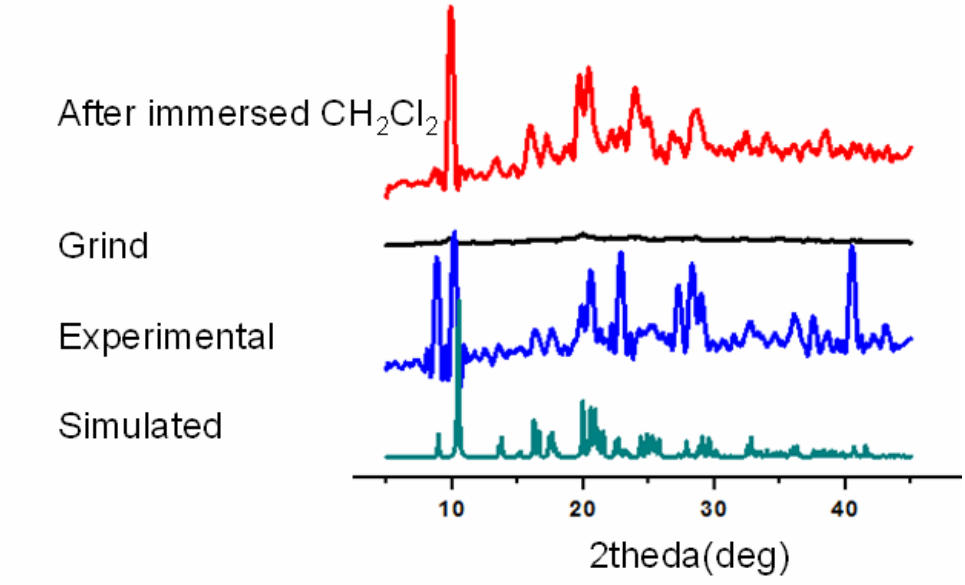


**Fig. S2** The PXRD patterns of **1** under different conditions.

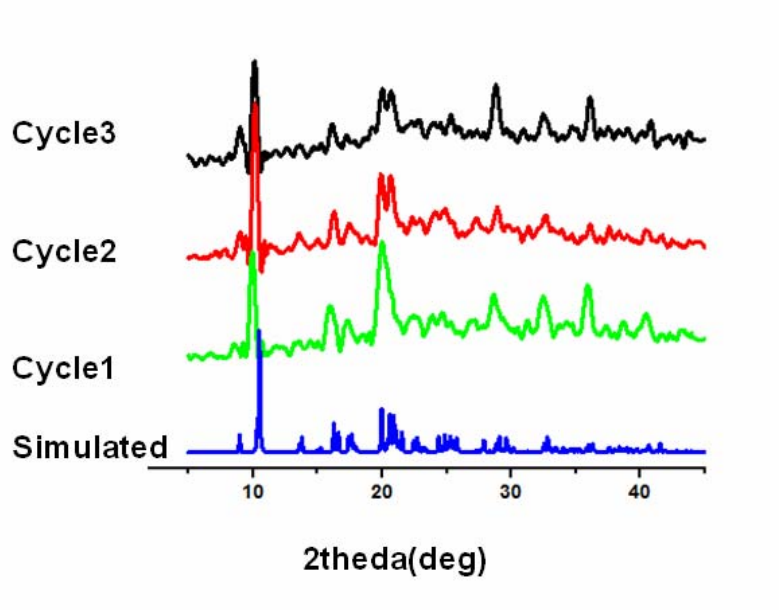


**Fig. S3** The PXRD patterns of **1** under different conditions**.**

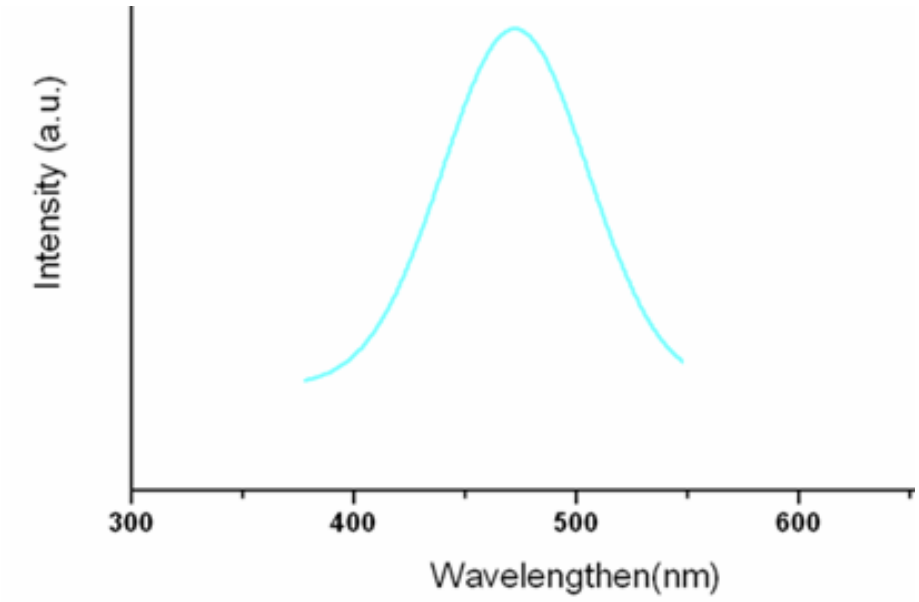


**Fig. S4** PL spectra of the dm-bim ligand under λex= 365 nm.

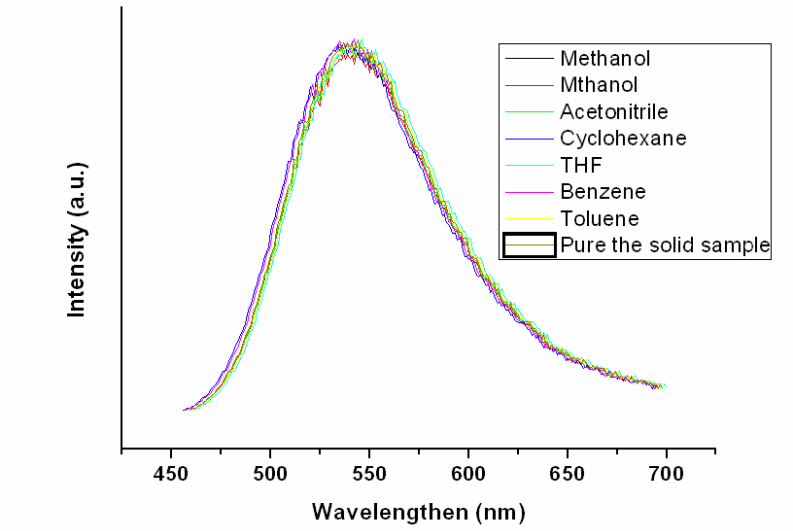


**Fig. S5** PL spectra of the sample quenching response to different solvent and pure the solid sample under λex= 365 nm.

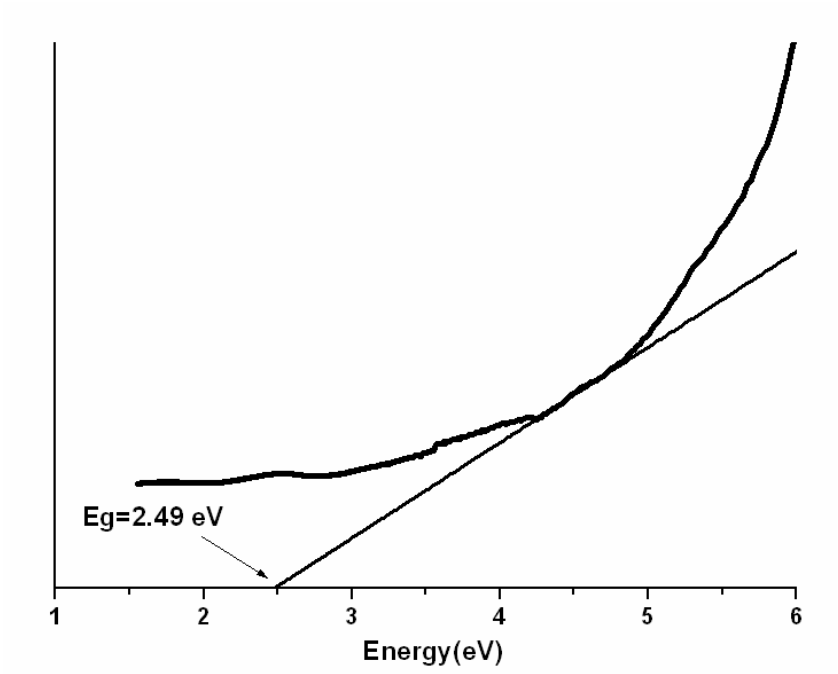


**Fig. S6** The $\alpha h\nu^2$ vs $h\nu$ curve of **1**.

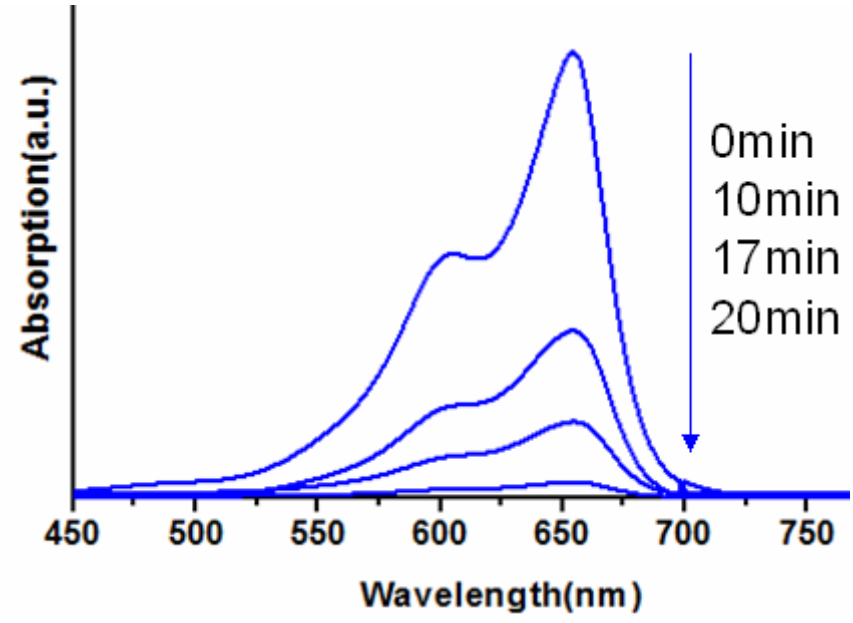


**Fig. S7** Time dependent UV/Vis spectra of MB over photocatalyst **1**.

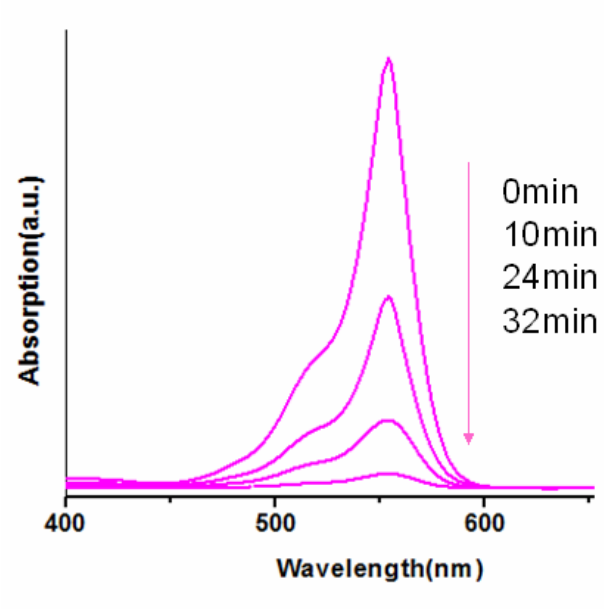


**Fig. S8** Time dependent UV/Vis spectra of RhB over photocatalyst **1**.

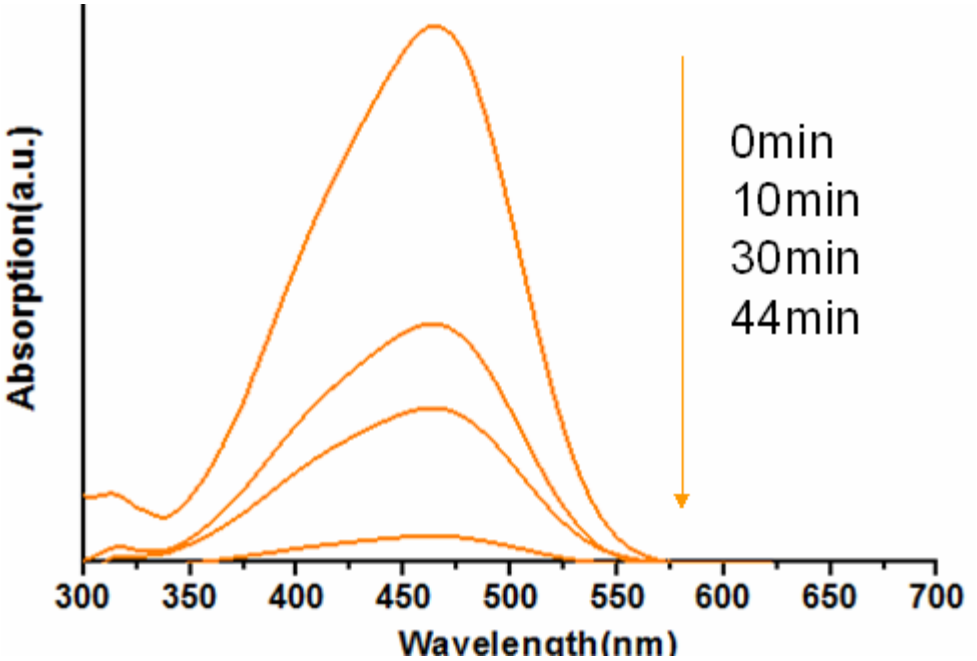


**Fig. S9** Time dependent UV/Vis spectra of MO over photocatalyst **1**.

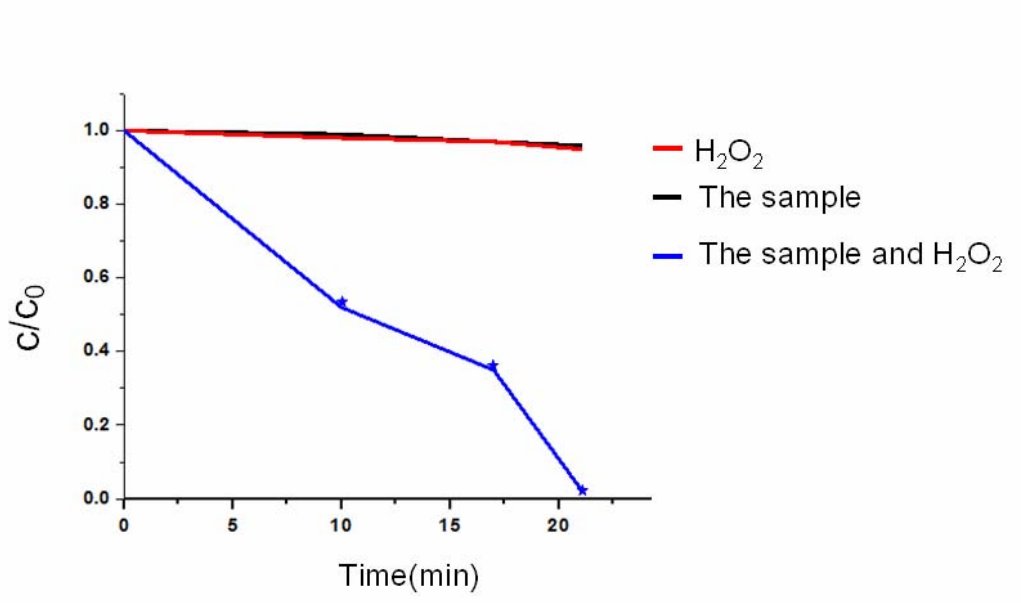


**Fig. S10** Photodecomposition of MB dye in solution over different condition with fluorescent light.

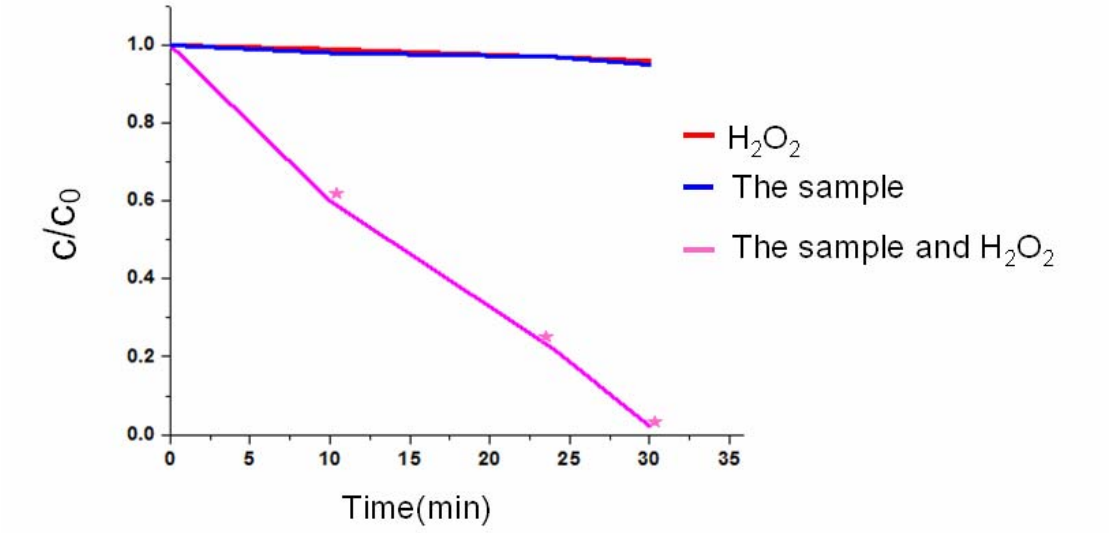


**Fig. S11** Photodecomposition of RhB dye in solution over different condition with fluorescent light.

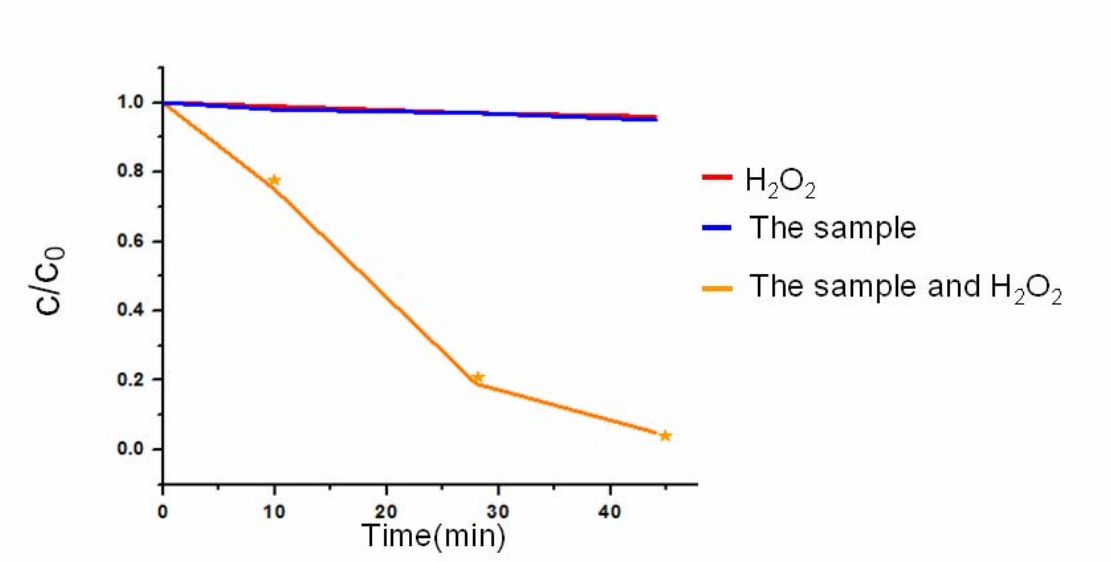


**Fig. S12** Photodecomposition of MO dye in solution over different condition with fluorescent light.

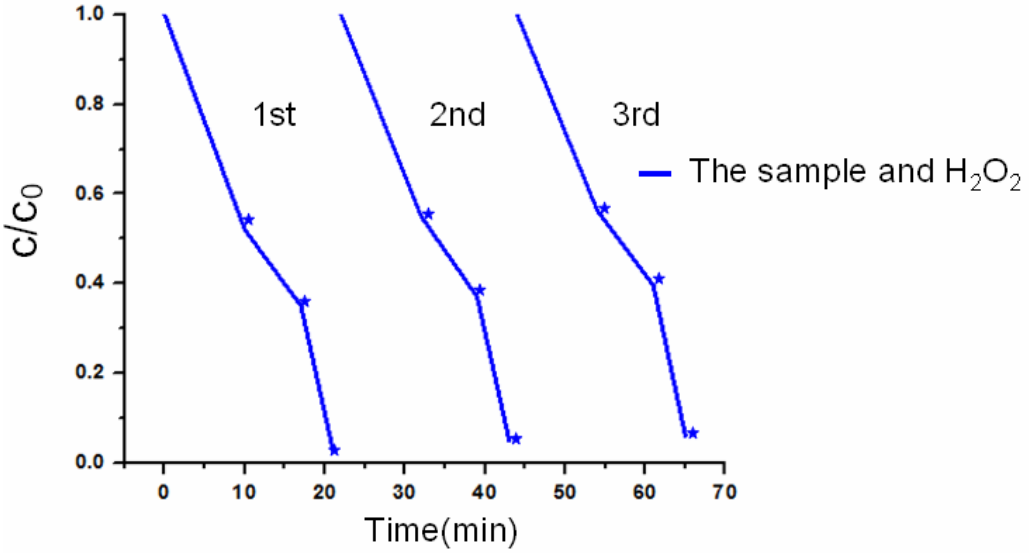


**Fig. S13** Recycling test on **1** for MB photodegradation under fluorescent light irradiation.

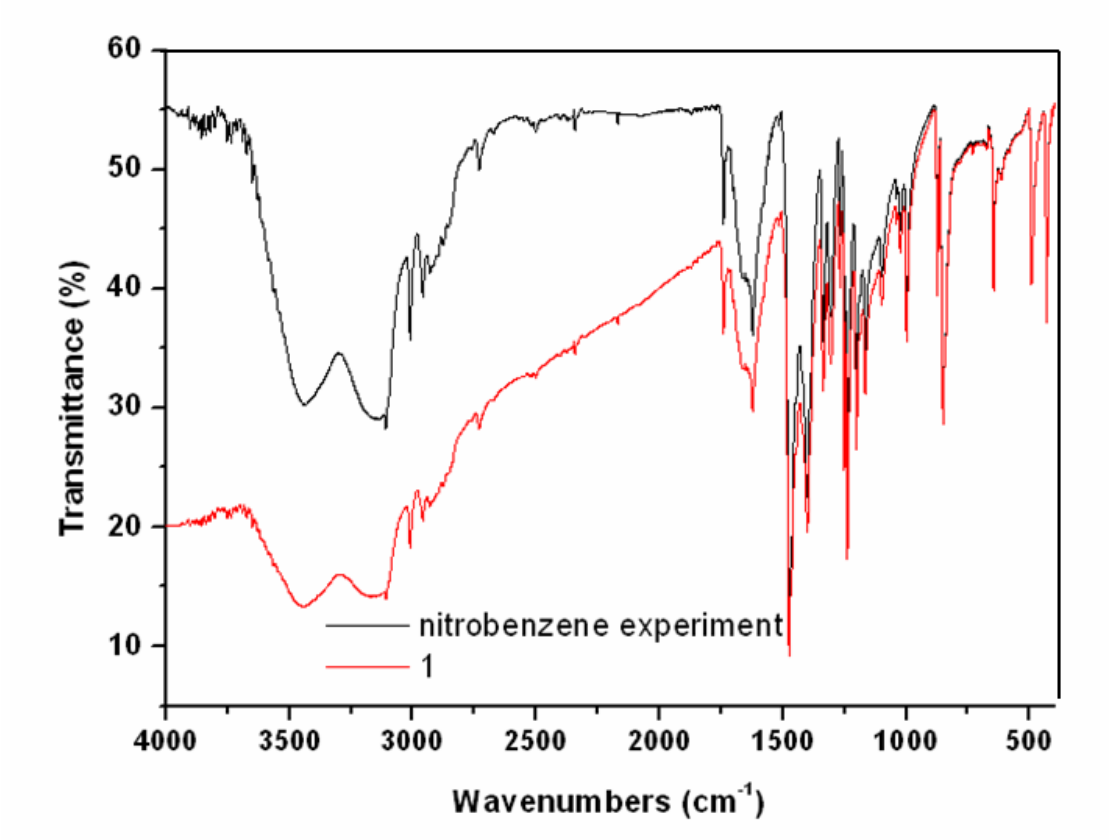


**Fig. S14** IR spectra (4000-500 $cm^{-1}$) of **1** (red) and its sample upon immersion in nitrobenzene (black). Two spectra almost keep the same effect.

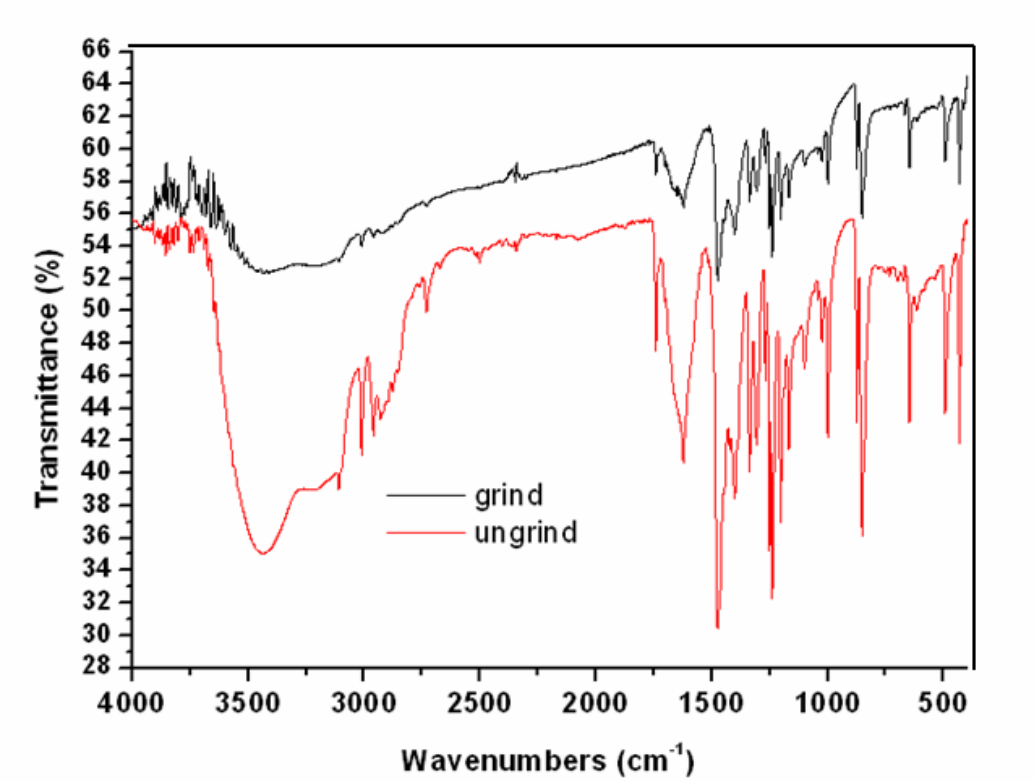


**Fig. S15** IR spectra (4000-500 $cm^{-1}$) of **1** (red) and ground sample (black). Two spectra almost keep the same effect.

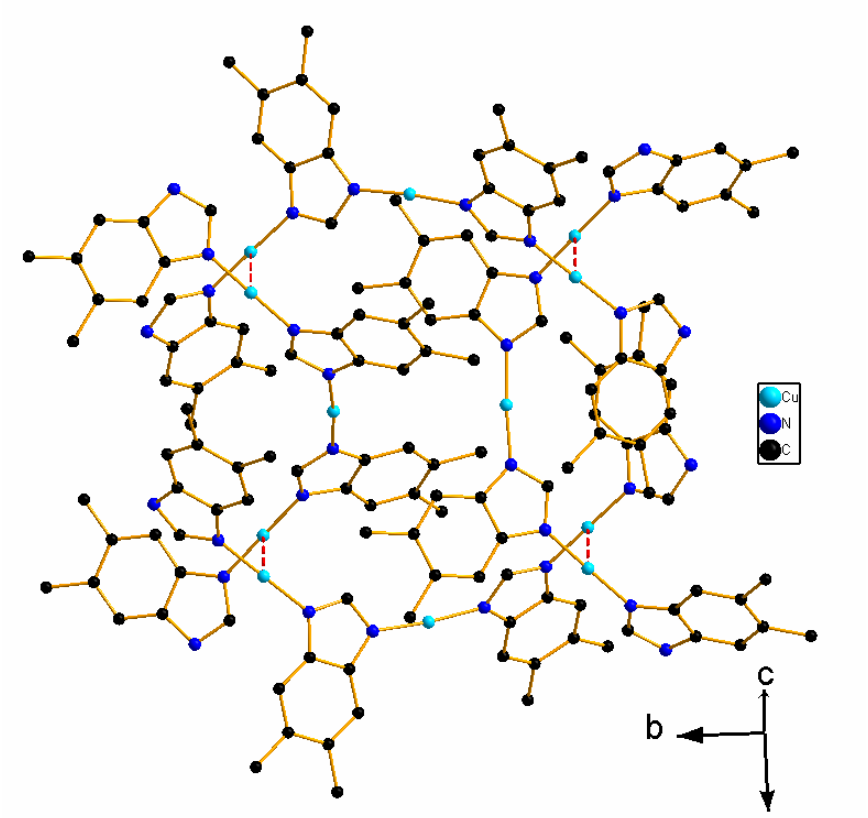


**Fig. S16** The Cu···Cu interactions between helical chains (red dashed line).