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°C). 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 (H₂O₂ 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 The samples were withdrawn regularly from the reactor, and dispersed powders were removed by centrifugation. At different time intervals, analytical samples were withdrawn and analyzed by UV/Vis spectroscopy.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 $Eg = 2.49$eV for the compound.¹,²

References:

**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 $\lambda_{ex}=365$ nm.
Fig. S5 PL spectra of the sample quenching response to different solvent and pure the solid sample under $\lambda_{\text{ex}} = 365$ nm.

Fig. S6 The $\alpha h^2$ vs $h$ 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 I.

**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 I (red) and ground sample (black). Two spectra almost keep the same effect.

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