

## Supporting Information

### **A polymerized ionic liquid-supported B<sub>12</sub> catalyst with a ruthenium trisbipyridine photosensitizer for photocatalytic dechlorination in ionic liquids**

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## Chemicals.

Syntheses of the vitamin B<sub>12</sub> derivatives (Figure S1) were previously reported by our group.<sup>S1</sup> Photosensitizer [Ru(bpy)<sub>3</sub>]Cl<sub>2</sub> was purchased from Aldrich. The DDD, DDMS, DDMU and TTDB (*E/Z*) were identified as dechlorinated products by the photocatalytic reaction and were identified by comparison to our reported data.<sup>S2</sup>

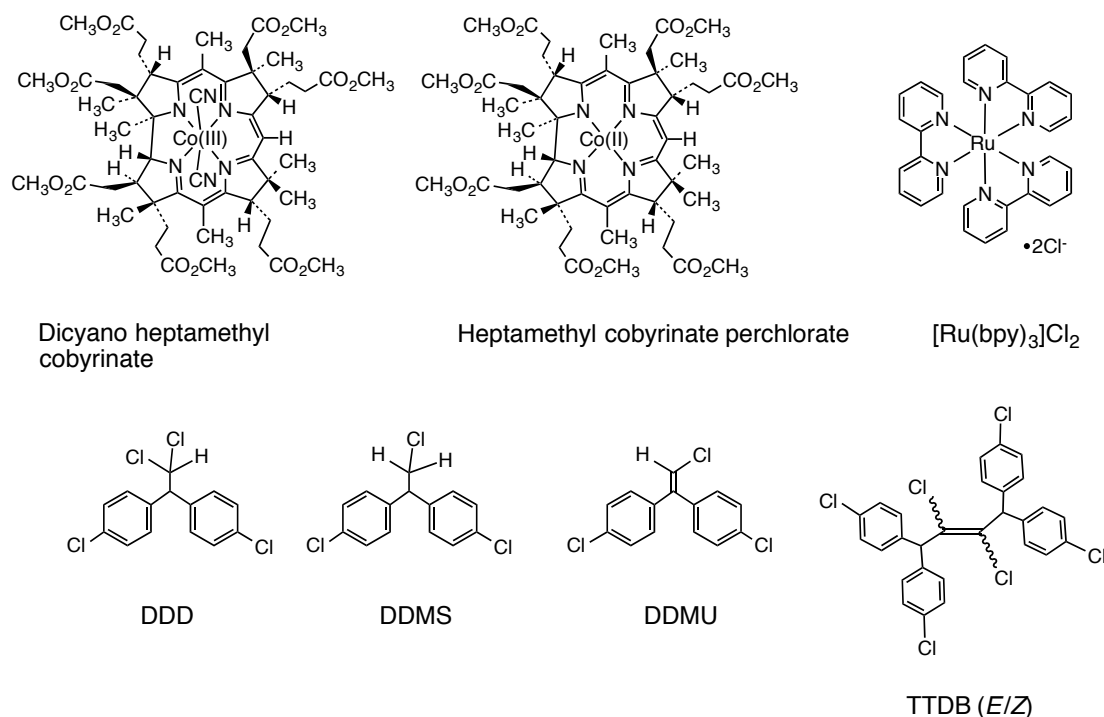


Figure S1

## Dynamic Light Scattering (DLS).

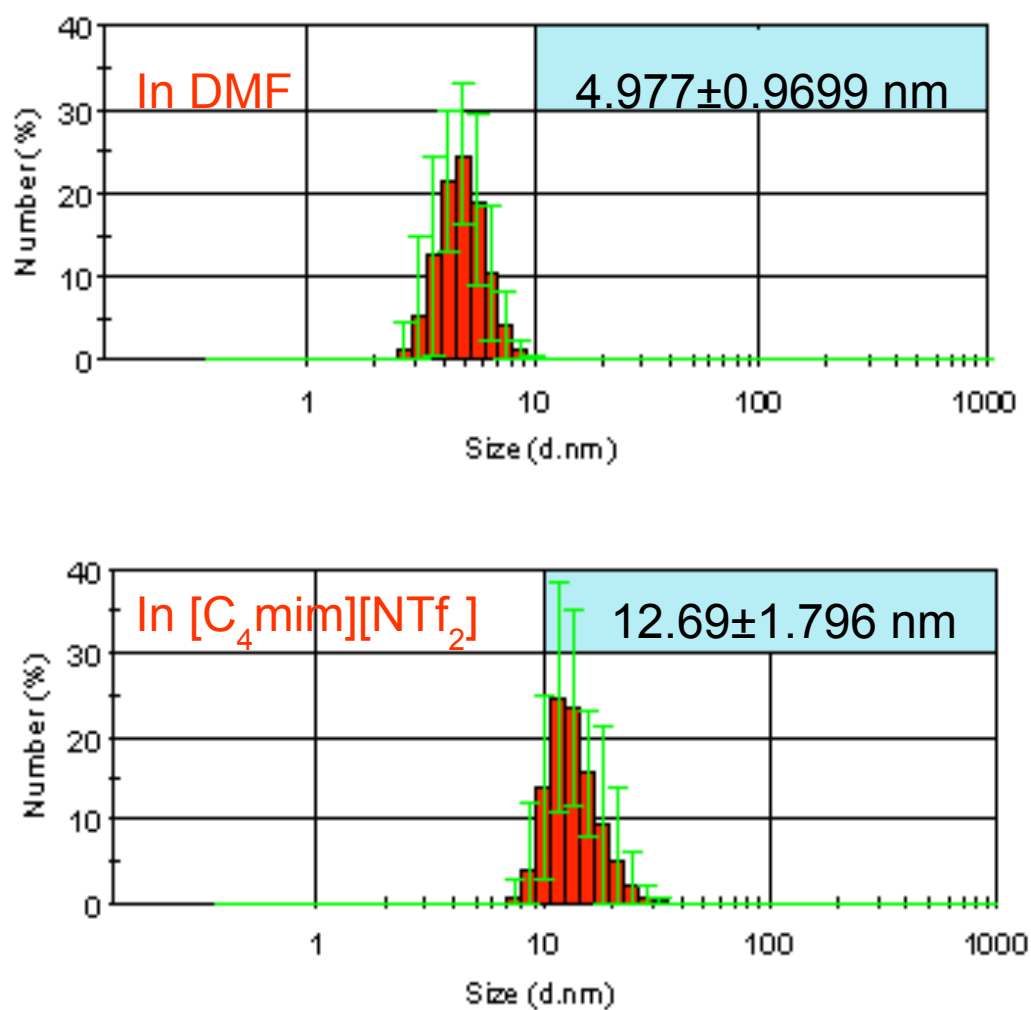
The DLS was measured by a Zetasizer NanoZS (MALVERN) instrument at 25 °C using an incident He-Ne laser (633 nm). The correlation time of the scattered light intensity  $G(\tau)$  was measured several times and their averaged data were fitted to equation 1, where  $B$  is the baseline,  $A$  is the amplitude,  $q$  is the scattering vector,  $\tau$  is the delay time, and  $D$  is the diffusion coefficient.

$$G(\tau) = B + A \exp(-2q^2D\tau) \quad (1)$$

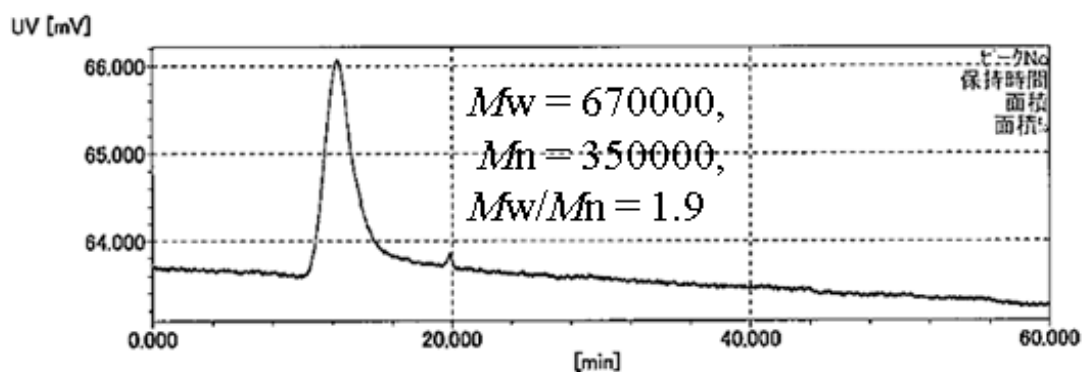
The hydrodynamic radius ( $R_H$ ) of the scattering particles was calculated by the Stokes-Einstein equation (eq. 2), where  $\eta$  is the solvent viscosity,  $k_B$  is Boltzmann's constant and  $T$  denotes the absolute temperature.

$$R_H = k_B T / 6\pi \eta D \quad (2)$$

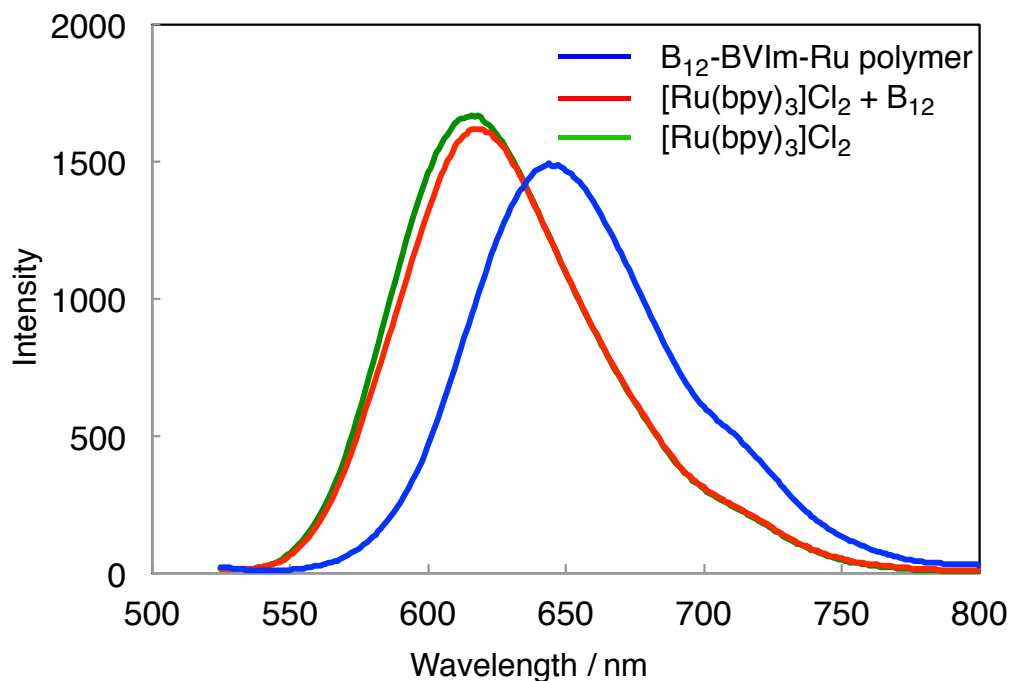
The polymer was dissolved in DMF and  $[C_4\text{mim}][\text{NTf}_2]$ , and the solutions were passed through a 0.45- $\mu\text{m}$  filter (HLC-disk, Kanto Chemical Co., Inc.).



**Figure S2.** DLS data for B<sub>12</sub>-BVIm-Ru polymer (NTf<sub>2</sub><sup>-</sup> form) in DMF and  $[C_4\text{mim}][\text{NTf}_2]$ .



**Figure S3.** GPC of the B<sub>12</sub>-BVIm-Ru polymer (Cl form).



**Figure S4.** Emission spectra of B<sub>12</sub>-BVIm-Ru polymer (NTf<sub>2</sub><sup>-</sup> form) (blue line), [Ru(bpy)<sub>3</sub>]Cl<sub>2</sub> + B<sub>12</sub> (dicyano heptamethyl cobyrinate) (red line) and [Ru(bpy)<sub>3</sub>]Cl<sub>2</sub> alone (green line) in DMF at room temperature. ( $\lambda_{ex}$ =455 nm, [B<sub>12</sub> complex]=1 x 10<sup>-5</sup> M; [Ru complex]=1.28 x 10<sup>-5</sup> M.)

## References

- (S1) Y. Murakami, Y. Hisaeda and A. Kajihara, *Bull. Chem. Soc. Jpn.*, 1983, **56**, 3642.
- (S2) (a) H. Shimakoshi, E. Sakumori, K. Kaneko and Y. Hisaeda, *Chem. Lett.*, 2009, **38**, 468; (b) H. Shimakoshi, I. Isao, M. Tokunaga and Y. Hisaeda, *Acta Cryst.* 2005, *E61*, o2063; (c) H. Shimakoshi, I. Isao, M. Tokunaga and Y. Hisaeda, *Acta Cryst.* 2004, *E60*, o1470, H. Shimakoshi, M. Tokunaga and Y. Hisaeda, *Dalton Trans.*, 2004, 878.