

Supplementary Material

Highly dispersed Ru nanoparticles on a bipyridine-linked covalent organic framework for efficient photocatalytic CO₂ reduction

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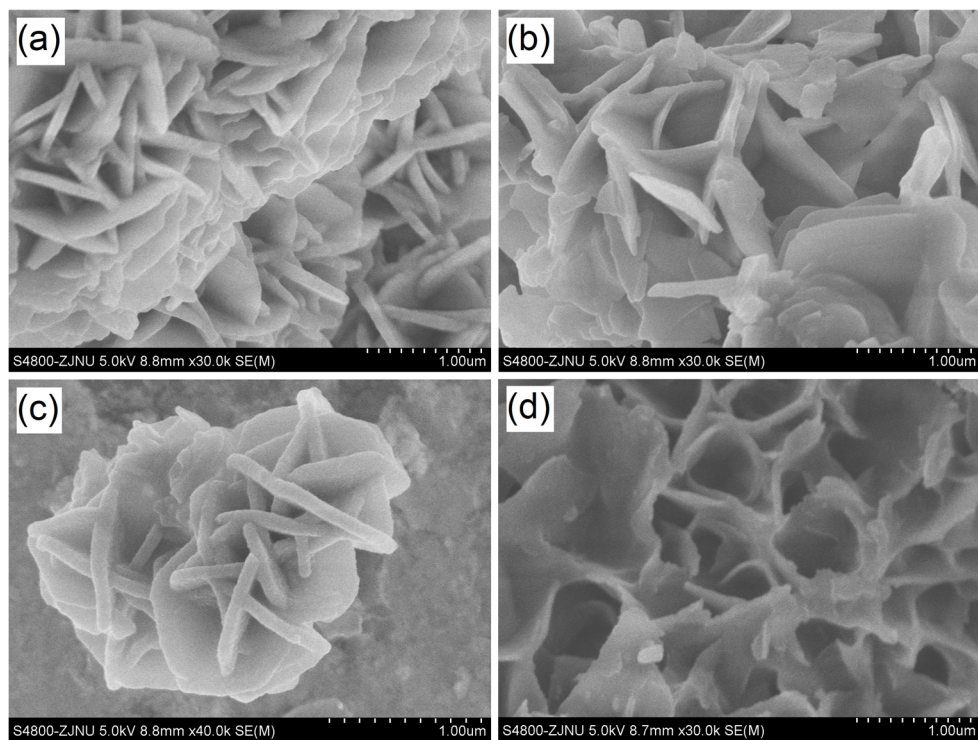


Fig. S1. SEM images of TpBpy (a), 1-Ru@TpBpy (b), 2-Ru@TpBpy (c), and 3-Ru@TpBpy (d).

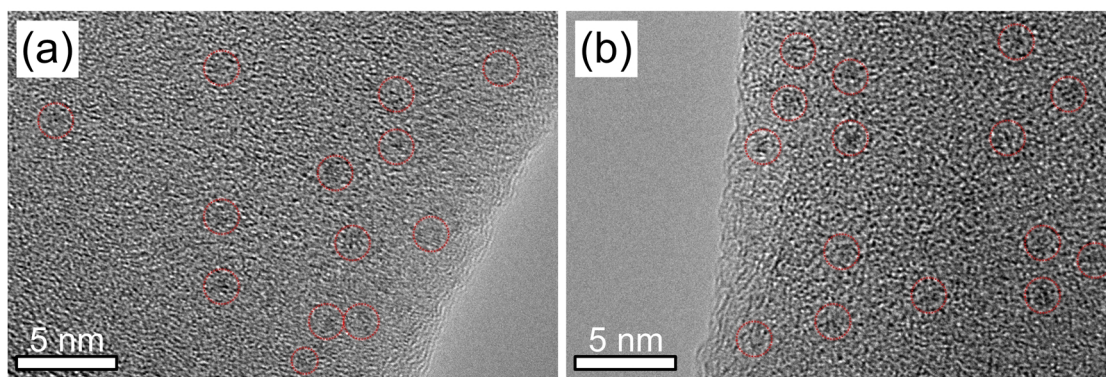


Fig. S2. HR-TEM images of the fresh (a) and used (b) 1-Ru@TpBpy after the 5th-run photocatalytic reaction.

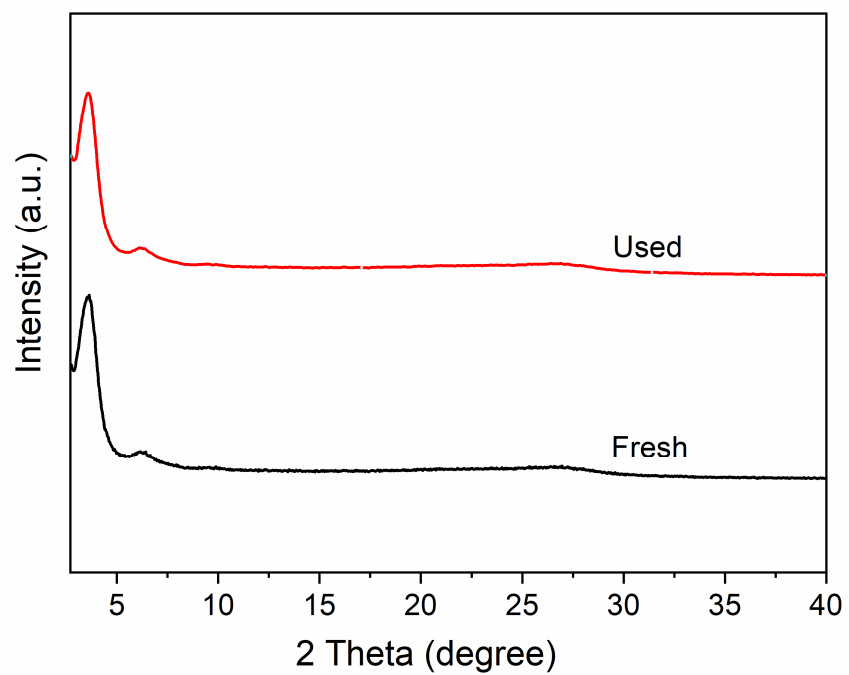


Fig. S3. XRD patterns of the fresh (black) and used 1-Ru@TpBpy after the 5th-run photocatalytic reaction (red).

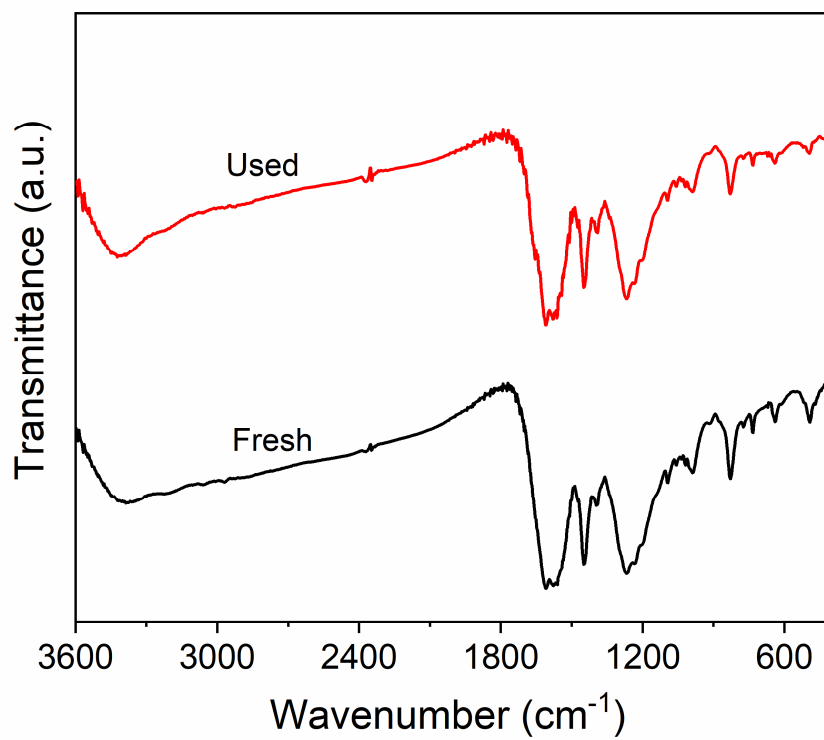


Fig. S4. FT-IR spectra of the fresh (black) and the used (red) 1-Ru@TpBpy after the 5th-run photocatalytic reaction.

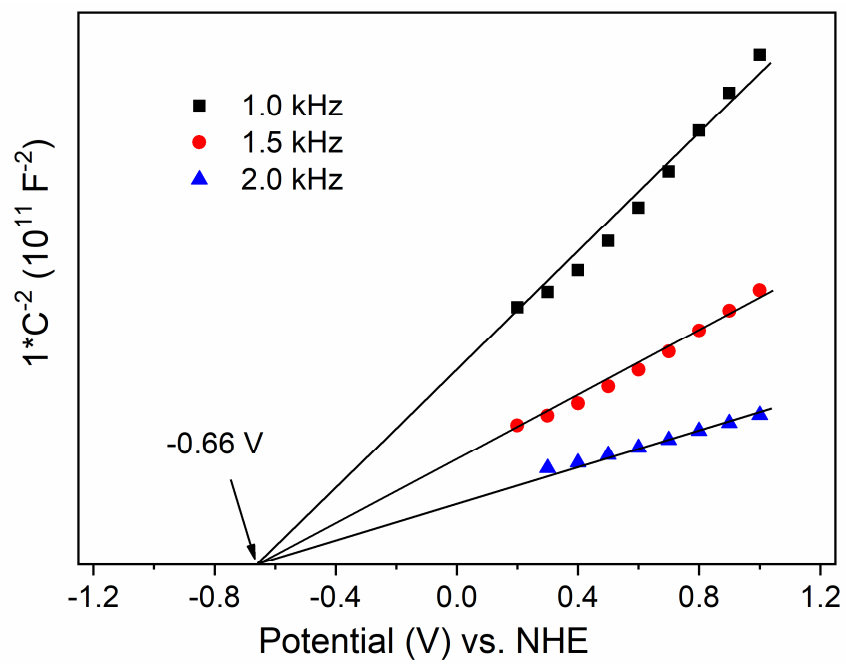


Fig. S5. Mott-Schottky plots of TpBpy measured at different frequencies.

Table S1. Summary of the photocatalytic CO₂ reduction performances over COF- and MOF-based catalysts

Photocatalyst	Photosensitizer	Product	Light source	Ref.
		Yield* ($\mu\text{mol}\cdot\text{g}^{-1}_{\text{cat}}\text{h}^{-1}$)		
1-Ru@TpBpy	-	HCOOH: 172	300 W Xe lamp (420-800 nm)	This work
TpBD-(OCH ₃) ₂	-	HCOOH: 108.3	300 W Xe lamp (420-800 nm)	1
3.0 wt.% Ru/TpPa-1	-	HCOOH: 108.8	300 W Xe lamp (420-800 nm)	2
N ₃ -COF	-	CH ₃ OH: 0.57	500 W Xe lamp (420-800 nm)	3
TTCOF-Zn	-	CO: 2.1	300 W Xe lamp (420-800 nm)	4
COF-318-TiO ₂	-	CO: 69.7	300 W Xe lamp (380-800 nm)	5
CT-COF	-	CO: 102.7	300 W Xe lamp (≥ 420 nm)	6
Ni-TpBpy	[Ru(bpy) ₃]Cl ₂	CO: 324.6	300 W Xe lamp (≥ 420 nm)	7
Re-CTF	[Re(CO) ₅]Cl	CO: 353.1	300 W Xe lamp (200-1100 nm)	8
Re-COF	[Re(CO) ₅]Cl	CO: 750	225 W Xe lamp (≥ 420 nm)	9
Re-TpBpy	[Re(CO) ₅]Cl	CO: 270.8	200 W Xe lamp (≥ 390 nm)	10
DQTP COF-Co	[Ru(bpy) ₃]Cl ₂	HCOOH: 333.5 CO: 480	300 W Xe lamp (≥ 420 nm)	11
Ni-PCD@TD-COF	[Ru(bpy) ₃]Cl ₂	CO: 95.6	300 W Xe lamp (≥ 420 nm)	12
NH ₂ -MIL-125(Ti)	-	HCOOH: 16.3	300 W Xe lamp (420-800 nm)	13
NH ₂ -UiO-66(Zr)	-	HCOOH: 26.4	300 W Xe lamp (420-800 nm)	14
Pt/NH ₂ -MIL-125(Ti)	-	HCOOH: 25.9	300 W Xe lamp (420-800 nm)	15
PCN-222(Zr)	-	HCOOH: 60	300 W Xe lamp (420-800 nm)	16

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