## **Electronic Supporting information**

## Enhanced light driven CO<sub>2</sub> conversion based on silver bismuth sulfide hollow octahedrons coated with amorphous metal-organic frameworks

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Fig. S1 (a) C 1s, (b) N 1s, (c) O 1s and (d) overall high resolution XPS spectra of ABS-

20, ABS-60, ABS-120 and ABS-HO.



Fig. S2 FTIR spectra of ABS-60, ABS-120, ABS-HO and PVP.



Fig. S3 Tauc plots of (a) ABS-20, (b) ABS-40, (c) ABS-60, (d) ABS-80, (e) ABS-100

and (f) ABS-120 derived from UV-vis-NIR diffuse reflectance spectra.



**Fig. S4** TEM images of AgBiS<sub>2</sub> nanorods obtained in the absence of (a) Br<sup>-</sup> ions and (b) PVP molecules.



**Fig. S5** (a-g) HAADF-STEM with EDX elemental mapping images of a single hollow octahedral nanostructure (AZ-20). (h) The elemental distribution of AZ-20 along the dashed line denoted in (g).



Fig. S6 TEM images of (a) AZ-10, (b) AZ-20, (c) AZ-40 and (d) ZIF-67.



Fig. S7 PXRD patterns of ABS-HO, AZ-10, AZ-20, AZ-40, ZIF-67 (Experimental) and ZIF-67 (Simulated).



Fig. S8 FTIR spectra of ABS-HO, AZ-20, and ZIF-67.



Fig. S9 UV-vis-NIR diffuse reflectance spectra of ABS-HO, AZ-20, and ZIF-67.



Fig. S10 (a) Direct band gap and (b) indirect band gap Tauc plots of ZIF-67.



**Fig. S11** High-resolution XPS spectra of (a) Bi 4f overlapping with S 2p region and (b) Ag 3d region of ABS-HO, AZ-10, AZ-20 and AZ-40. High-resolution XPS spectra of (c) Co 2p region and (d) N 1s region of AZ-10, AZ-20, AZ-40 and ZIF-67.



Fig. S12 TEM images of (a) AZ-20 and (b) ABS-HO after the photocatalytic test.



Fig. S13 PXRD pattern of AZ-20 after the photocatalytic test.



Fig. S14 (a) The average production rates under different conditions using AZ-20 as the main cocatalyst in the absence of AZ-20,  $CO_2$ ,  $Ru(bpy)_3Cl_2$ , TEOA and light respectively.



Fig. S15  $^{1}$ H NMR spectra of the upper and lower solutions after the photocatalytic test

of AZ-20.