Supporting Information

HZSM-5 zeolites containing impurity iron species for the photocatalytic reduction of CO$_2$ with H$_2$O

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**Fig. S1** Irradiance spectra of fluorescent UV light tubes.
**Fig. S2** Mass spectra of gas phase analyses after photocatalytic CO$_2$ reduction using (a) $^{13}$CO$_2$ ($^{13}$C content 99 atom %) and H$_2^{16}$O; (b) $^{12}$CO$_2$ and 1.01mL H$_2$O ($^{18}$H$_2$O : H$_2^{16}$O = 1:100) as a reactant. The photocatalytic reactions were conducted in CO$_2$-saturated aqueous solution with NK38 under UV light irradiation.
**Fig. S3** The stability test of HZSM-5 in three repeats of photocatalytic operations.
Fig. S4 Powder XRD patterns of HZSM-5: (a) fresh sample; (b) used sample.
**Fig. S5** CO$_2$ adsorption isotherm (1 atm, 273 K) of NK38 sample.
**Fig. S6** UV-vis DRS spectra of HZSM-5: (a) fresh sample; (b) used sample.
Fig. S7 ESR spectra of HZSM-5 in vacuum and darkness: (a) fresh sample; (b) used sample.