Supporting information

Sodium cation substitution in $Sr_2KTa_5O_{15}$ toward enhancement of photocatalytic conversion of CO_2 using H_2O as an electron donor

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Table S1 ICP test of the solution of washing mixture after flux treatment

Sample	Sr / g	Ta / g
$(KCl)_{100}(NaCl)_0$	6.6×10^{-3}	3.8×10^{-5}
$(KCl)_{55}(NaCl)_{45}$	0.19	1.8×10^{-6}

Table S2 Summarized photocatalyst for the conversion of CO_2 using H_2O as an electron donor under the similar experimental condition

Catalyst	Weight / g	Activity / μmol h^{-1}			Selectivity to CO (%)	Year	Ref.
		H_2	O_2	CO			
$BaLa_4Ti_4O_{15}$	0.3	10	16	22	68.8	2011	1
$ZnGa_2O_4/Ga_2O_3$	1.0	16.9	70.1	117	87.4	2014	2
$La_2Ti_2O_7$	1.0	4.9	5.3	5.2	51.5	2015	3
$ZnGa_2O_4$	1.0	8.5	74.3	155	95.0	2015	4
SrO/Ta_2O_5	1.0	3.8	5.1	6.8	64.2	2015	5
$KCaSrTa_5O_{15}$	0.5	15	46	97	87	2015	6
$Sr_2KTa_5O_{15}$	1.0	8.3	34.3	65.5	88.7	2016	7
$ZnTa_2O_6$	1.0	25.1	18.6	19.3	43.4	2016	8
$K_2YTa_5O_{15}$	1.0	16.2	43.2	91.9	84.9	2017	9
$NaTaO_3$:Ba	-[a]	31[b]	-[a]	318	91	2017	10
$SrNb_2O_6$	0.5	1.1	24.8	51.2	97.9	2017	11
$CaTiO_3$	0.3	3.1	-[a]	54	94	2017	12
Mg−Al LDH/Ga_2O_3	1.0	131	167	212	61.7	2017	13
Pr/Ga_2O_3	0.5	64.7	150	249	79.4	2017	14
$Sr_{1.6}K_{0.37}Na_{1.43}Ta_5O_{15}$	1.0	16	53.7	94.6	85.3	-	This work

[a] Not available in paper. [b] Calculated out from the selectivity.

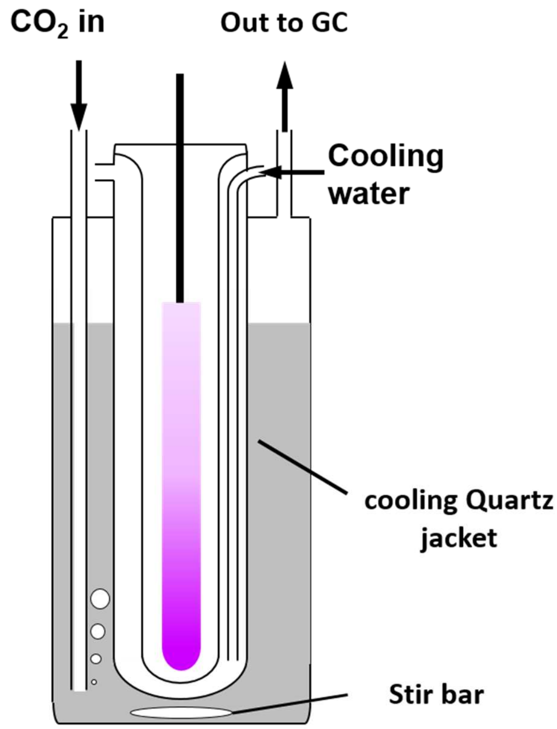

Figure S1 Scheme of the reactor for the photocatalytic conversion of CO_2 using H_2O as an electron donor.

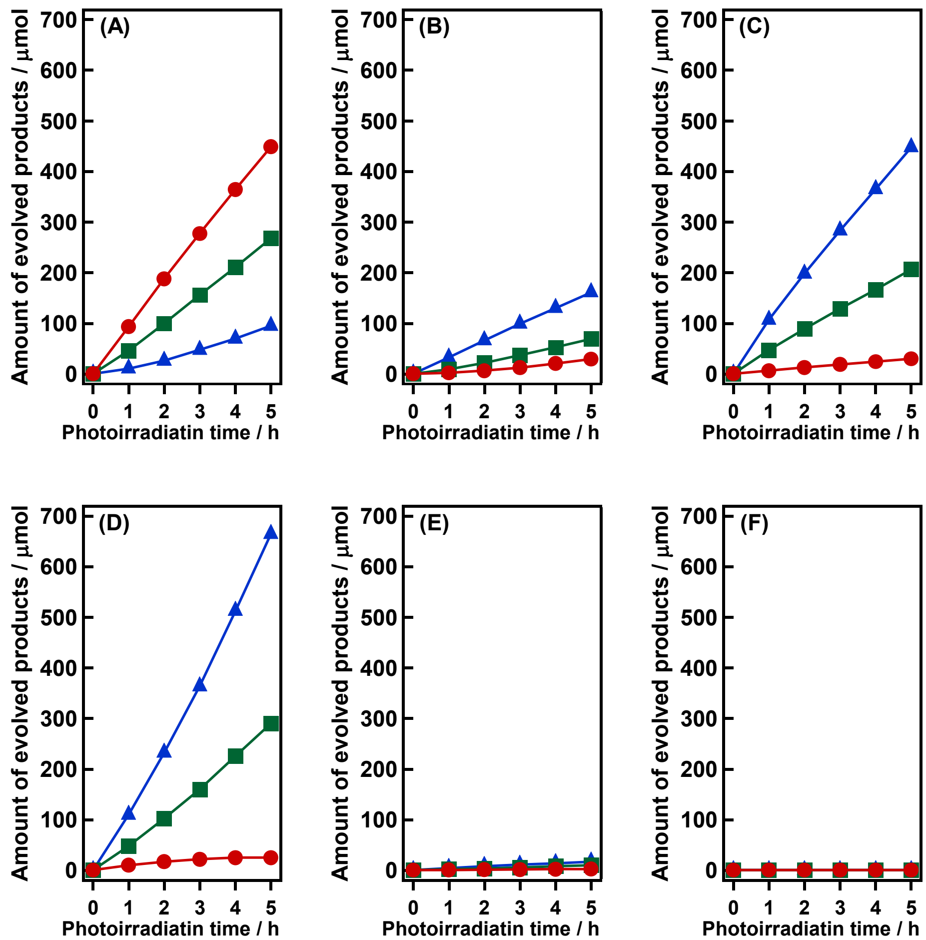

Figure S2 Time course of CO (circle), O_2 (square), and H_2 (triangle) evolutions over the sample calcined at 1173 K for 3 h in $(KCl)_{55}(NaCl)_{45}$ flux under 5 h under typical condition (A), without a $NaHCO_3$ additive (B), without a Ag cocatalyst (C), with Ar flow at rate of 30 mL min^{-1} (D), without a catalyst (E), and without photoirradiation (F).

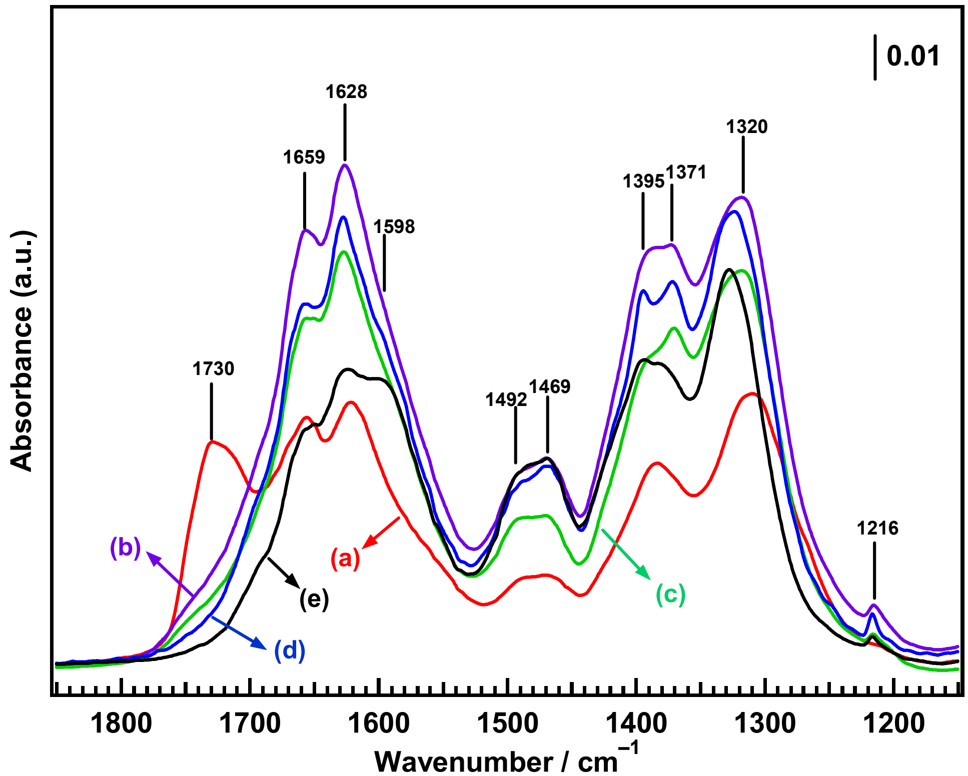

Figure S3 Difference IR spectra of adsorbed CO_2 species on samples calcined at 1173 K for 3 h with flux reagent ratios of $(KCl)_{100}(NaCl)_0$ (a), $(KCl)_{75}(NaCl)_{25}$ (b), $(KCl)_{55}(NaCl)_{45}$ (c), $(KCl)_{25}(NaCl)_{75}$ (d), and $(KCl)_0(NaCl)_{100}$ (e).

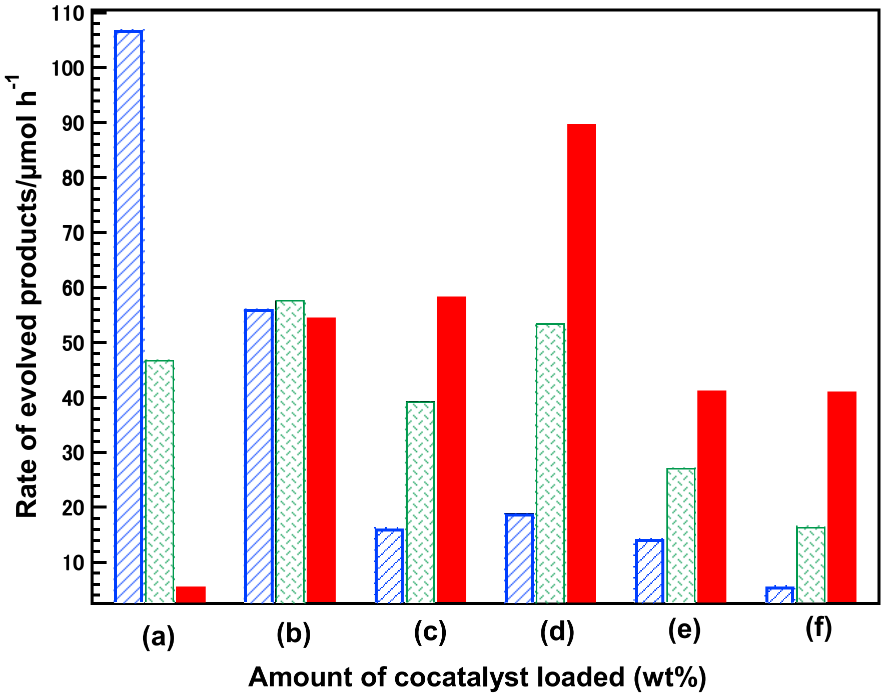

Figure S4 Rates of CO (red filled), O_2 (green dotted), and H_2 (blue slashed) evolution over $(KCl)_{55}(NaCl)_{45}$ sample with 0 (a), 0.1 (b), 0.5 (c), 1.0 (d), 2.0 (e), and 3.0 (f) wt% of Ag cocatalyst loading.

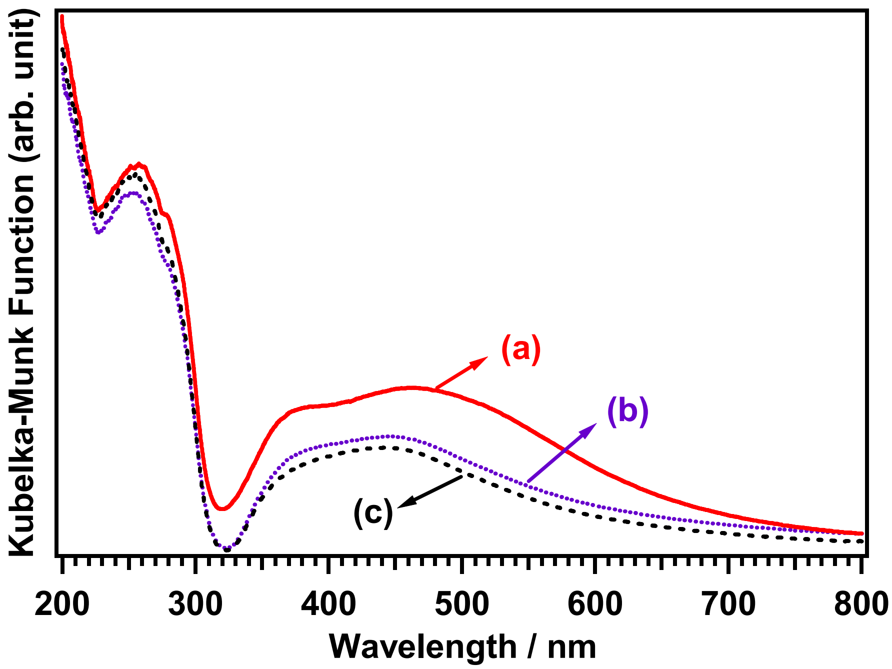

Figure S5 UV-Vis DRS of 1.0 wt% Ag loaded sample calcined at 1173 K for 3 h in $(KCl)_{100}(NaCl)_0$ flux before reaction (a), after first run (b), and after third run (c).

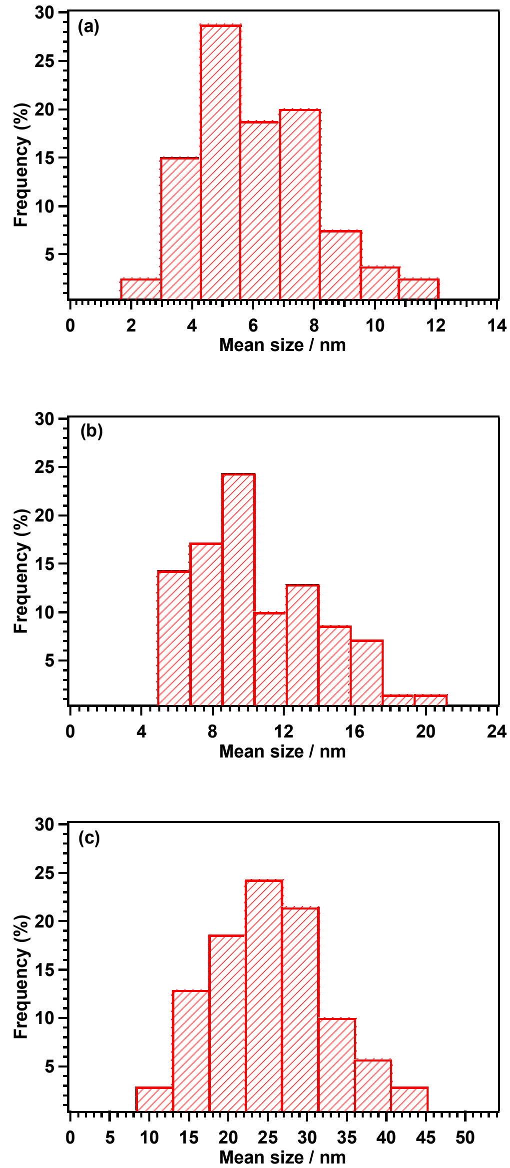

Figure S6 Size distribution of Ag nanoparticles before reaction(a), after first run (b), and third run (c) for photocatalytic conversion of CO_2 by H_2O over $(KCl)_{55}(NaCl)_{45}$ catalyst.

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