Supporting Information

Table Captions:

Table. S1 Comparison of CO production rate, CO selectivity for R-0.25H_2 catalysts and literature reported catalysts.

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catalyst	H_2:CO_2 ratio	WHSV (mL/g/h)	Temperature (°C)	Rate ($mmol_{CO}\cdot g_{cat}^{-1}\cdot h^{-1}$)	CO selectivity (%)	Ref.
R-0.25H_2	4:1	60000	350	50.2	100	This work
			400	77.3	100	
			450	104.2	100	
			500	133.7	100	
			550	144.0	100	
			600	163.4	100	
CuZnAl	3:1	60000	400	72.5	100	[1]
			500	104.5	100	
Cu/CeO_2	4:1	30000	350	28.9	100	[2]
			400	45.9	100	
			450	58.3	100	
			500	68.3	100	
			550	75.0	100	
			600	81.7	100	
Ni@Au/SiO_2	3:1	60000	350	30.5	95	[3]
			400	55.0	95	
			450	80.0	94	
			500	102.6	96	
			550	109.9	95	
			600	110.5	95	
Mo_2C@N-C	3:1	24000	400	73.6	98	[4]
			450	89.1	99	
			500	102.9	100	
			550	111.4	100	
			600	126.4	100	
Ni-Cu/γ-Al_2O_3	4:1	60000	350	25.7	75	[5]
			400	64.2	80	
Ni/CeO_2	4:1	14000	450	43.8	10	[6]
			500	82.5	20	
CuIn/CeO_2	4:1	3000	500	45.2	100	[7]
			550	54.9	100	
RuNi/CeZr	4:1	24000	350	8.9	52	[8]
			400	12.1	63	
			450	15.1	64	
			500	28.3	60	
			550	52.3	61	
			600	82.4	63	
Ni_2P-SiO_2	4:1	12000	450	7.7	85	[9]

catalyst	H_2: CO_2 ratio	WHSV (mL/g/h)	Temperature (°C)	Rate ($mmol_{CO} \cdot g_{cat}^{-1} \cdot h^{-1}$)	CO selectivity (%)	Ref.
Ni_2P-SiO_2	4:1	12000	500	14.7	84	[9]
			550	18.9	80	
			600	22.0	82	

Figure Captions:

Fig. S1 CO_2 conversion of R-0.25H_2 and R-0.2H_2 at different temperatures.

Fig. S2. Relationship between CO_2 conversion and Cu^+ ratio (a)/oxygen vacancy content (b).

Fig. S3 (a) CO_2 conversion and (b) H_2 conversion of R-0.25H_2, R-0.5H_2 and R-H_2 catalysts at different particle sizes and WHSV (at 320 °C under P=1 bar).

Fig. S4 Changes of reaction rates of (a) R-0H_2 catalysts as a function of partial pressure of reactants at different temperatures (b) Apparent activation energy (Ea) of R-0H_2.

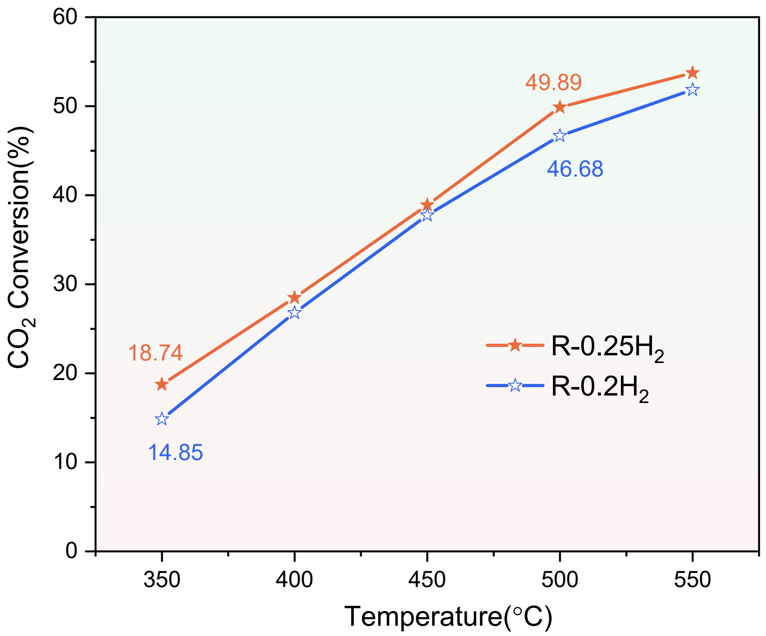

Fig. S1 CO_2 conversion of R-0.25H_2 and R-0.2H_2 at different temperatures.

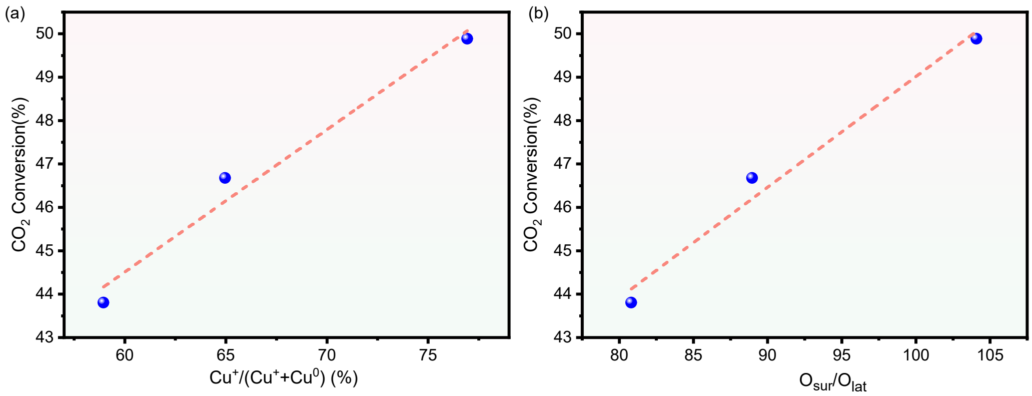

Fig. S2. Relationship between CO_2 conversion and Cu^+ ratio (a)/oxygen vacancy content (b).

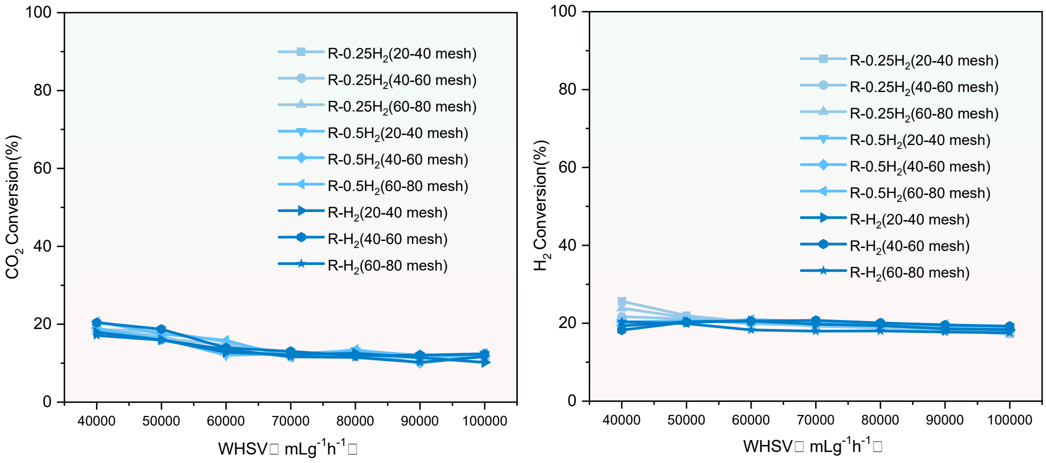

Fig. S3 (a) CO_2 conversion and (b) H_2 conversion of R-0.25H_2, R-0.5H_2 and R-H_2 catalysts at different particle sizes and WHSV (at 320 °C under P=1 bar).

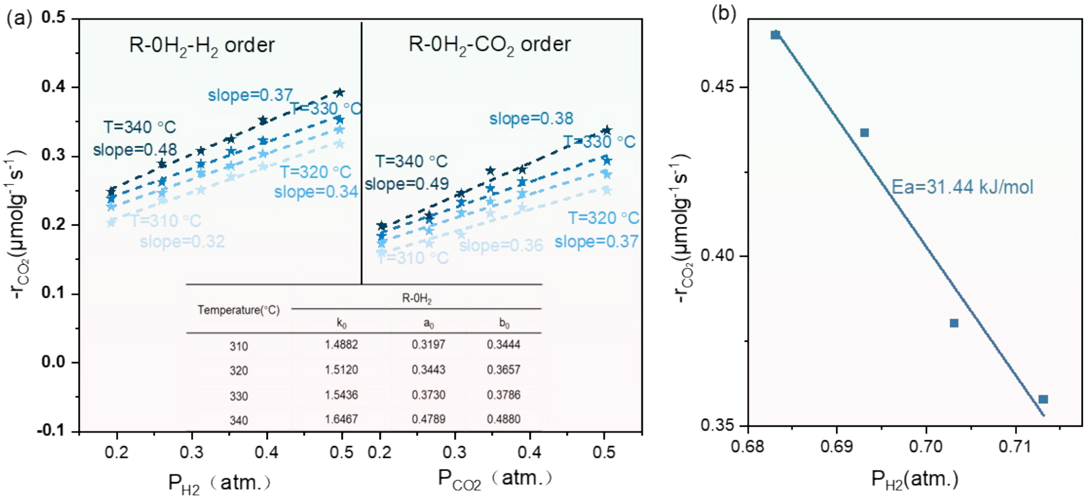

Fig. S4 Changes of reaction rates of R-0H_2 (a) catalysts as a function of partial pressure of reactants at different temperatures (b) Apparent activation energy (Ea) of R-0H_2.

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