Supporting Information

Effect of Mn content in $CuO/MnCeO_x$ catalysts on CO_2 hydrogenation for methanol synthesis

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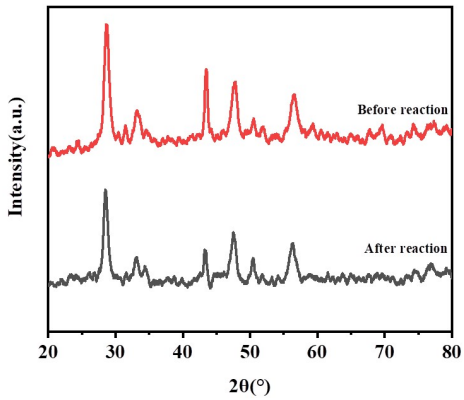

Fig. S1 Comparison of XRD patterns of $CuO/Mn_{0.2}CeO_x$ catalysts before and after the reaction

The XRD patterns of the $CuO/Mn_{0.2}CeO_x$ catalyst before and after the reaction (Fig. S1) were compared and we found that the structure of the catalyst remained the same before and after the reaction, and no new diffraction peaks were found, which indicates that our prepared $CuO/Mn_{0.2}CeO_x$ catalyst has a certain structural stability.

Table S1 Comparison of catalytic performance of different copper-based catalysts

Catalyst	P/ bar	T/ ℃	GHSV (ml/g·h^{-1})	X_{CO2} (%)	S_{CH3OH}(%)	Y_{CH3OH} (%)	STY_{CH3OH} ($mg_{MeOH}g_{cat}^{-1}h^{-1}$)	Ref
Cu/CeO_2	30	280	NA	10.0	73.0	7.30	NA	[1]
Cu/ZrO_2	30	280	NA	12.4	30.5	3.78	NA	[1]
$Cu/Ce_{0.4}Zr_{0.6}O_2$	30	280	NA	13.2	71.8	9.48	NA	[2]
Cu/AlCeO-7	40	240	6000	14.8	73.0	10.80	231.5	[3]
1Cu2Ni/CeO_2-NR	20	260	6000	15.9	71.6	11.38	244.0	[4]
4.7Cu-TiO_2	30	200	4800	9.4	96.1	9.03	154.9	[5]
$CuO/Mn_{0.2}CeO_x$	15	260	6000	14.2	82.3	11.68	250.0	This work

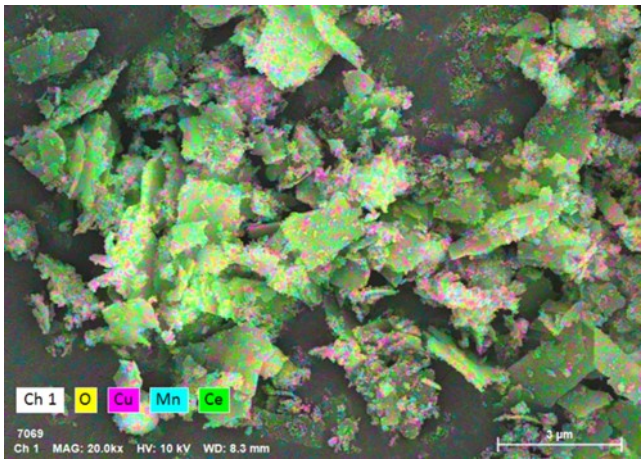

Fig. S2 Mappings of the $CuO/Mn_{0.2}CeO_x$

Table S2 Comparison of the catalytic performance of $CuO/Mn_{0.2}CeO_x$ catalysts at different pressures (T = 260°C, GHSV = 6000 $mL/g \cdot h^{-1}$)

P/bar	Con_{CO_2}(%)	Con_{CO}(%)	S_{CH3OH}(%)	STY_{CH3OH} ($g_{MeOH} g_{cat}^{-1} h^{-1}$)
10	14.052	18.963	80.725	0.243
15	14.184	17.766	82.261	0.250

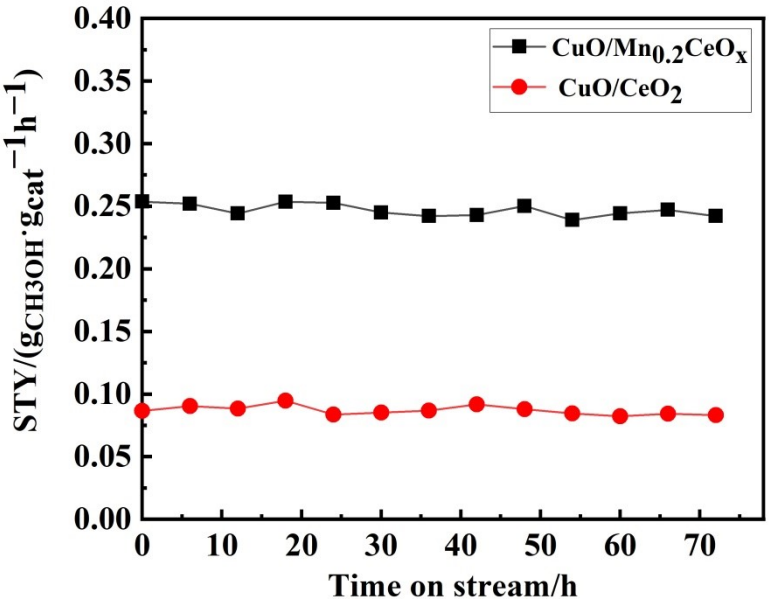

Fig.S3 Catalytic stability test of CuO/CeO_2 and $CuO/Mn_{0.2}CeO_x$ catalysts (T=260°C, P=15 bar, GHSV=6000 mL/g·h^{-1}).

Reference:

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