Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

Cu nanoparticles confined in siliceous MFI zeolite for methanol steam reforming

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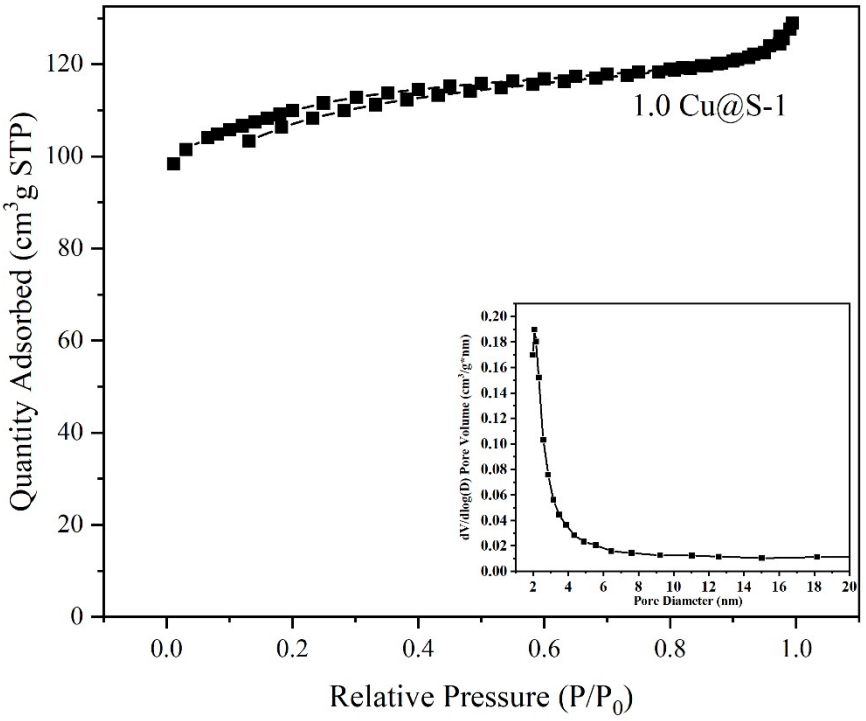

Fig. S1. N_2 adsorption–desorption isotherms of 1.0 Cu@S-1

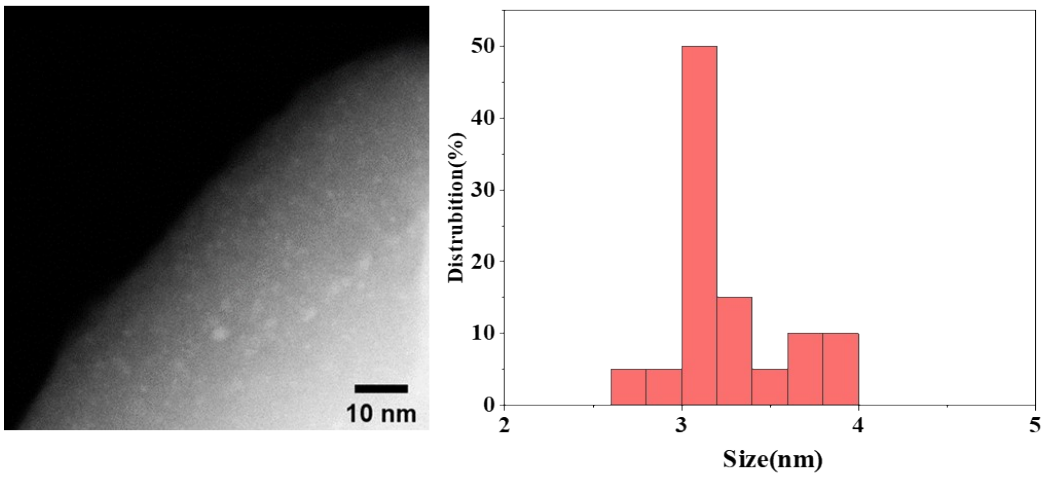

Fig. S2. HAADF-STEM image and corresponding Cu nanoparticles size distribution of the calcined 1.0 Cu/S-1

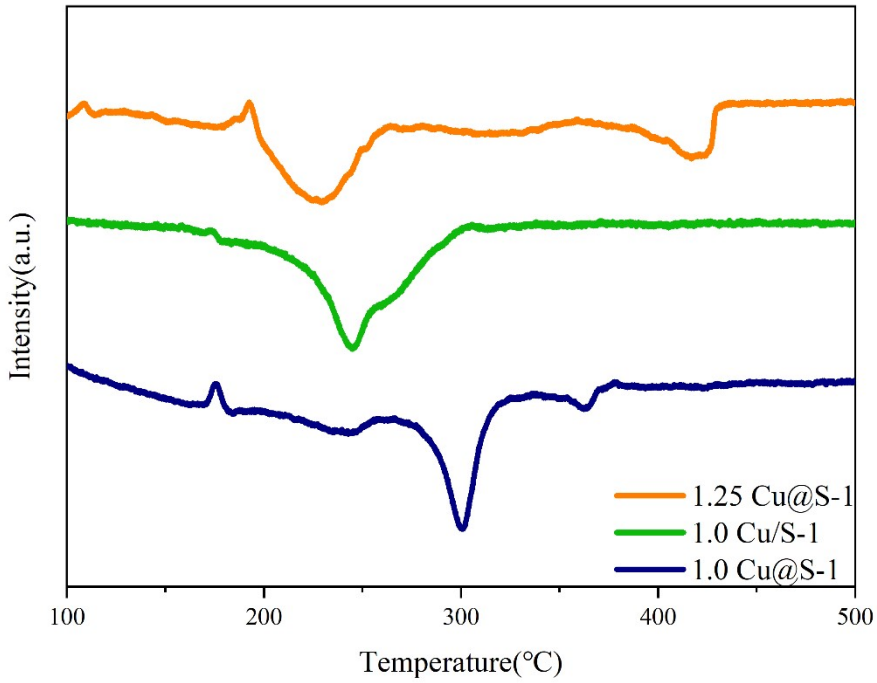

Fig. S3. H_2-TPR profile of 1.0 Cu@S-1, 1.0 Cu/S-1 and 1.25 Cu@S-1

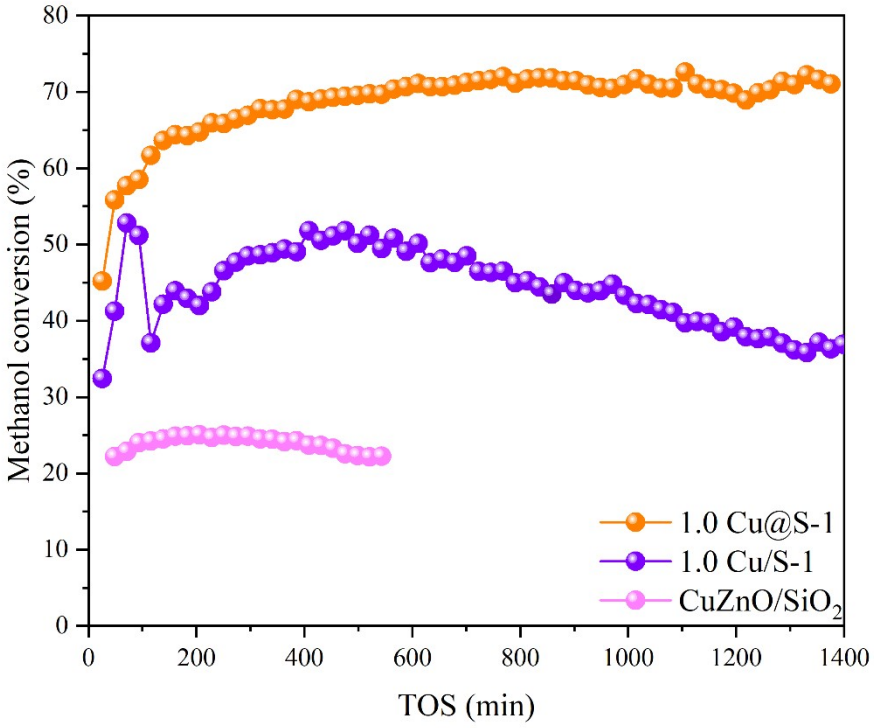

Fig. S4. Stability of 1.0 Cu@S-1, 1.0 Cu/S-1 and $CuZnO/SiO_2$ at 300°C (Reaction condition: 44% methanol, N_2 at a rate of 34 ml/min, WHSV = 4.55h^{-1}, 1 atm.)

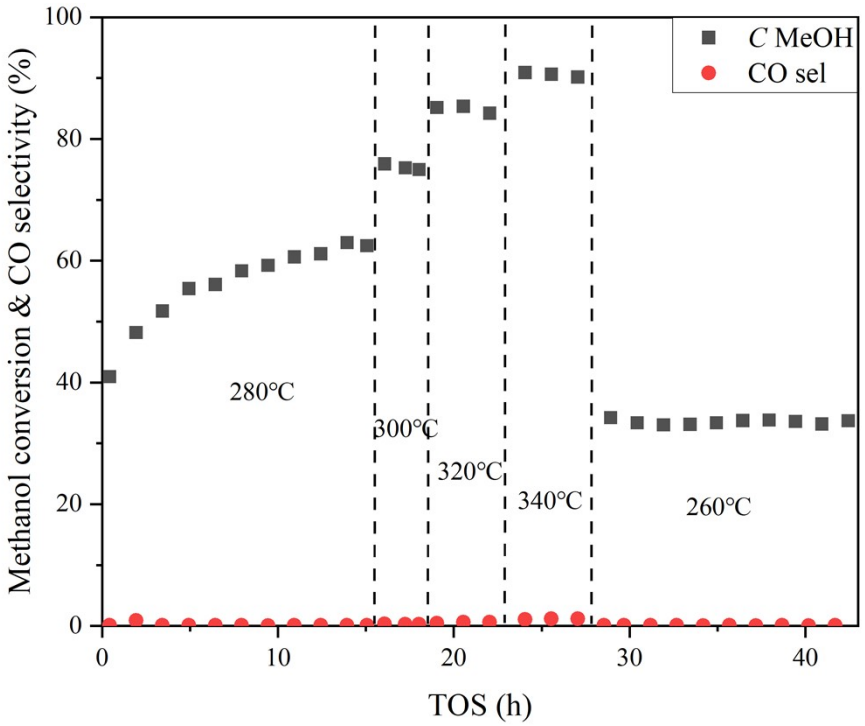

Fig. S5. TOS-dependent MSR performance of 1.0 Cu@S-1 catalyst under different temperature. (Reaction condition: 44% methanol, N_2 at a rate of 34 ml/min, WHSV = 4.55h^{-1}, 1 atm.)

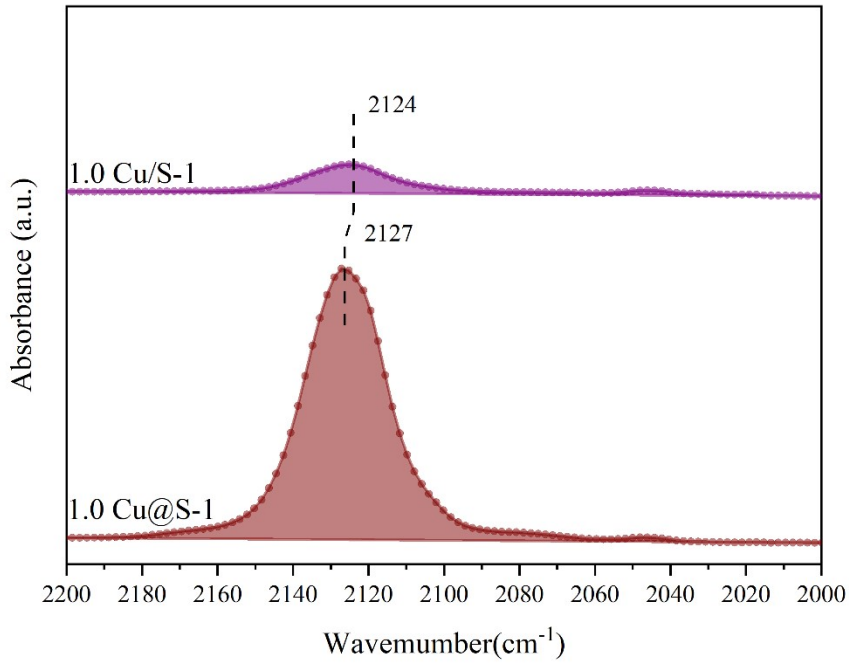

Fig. S6. *In-situ* CO-FTIR spectra of the reduced 1.0 Cu@S-1 and 1.0 Cu/S-1.

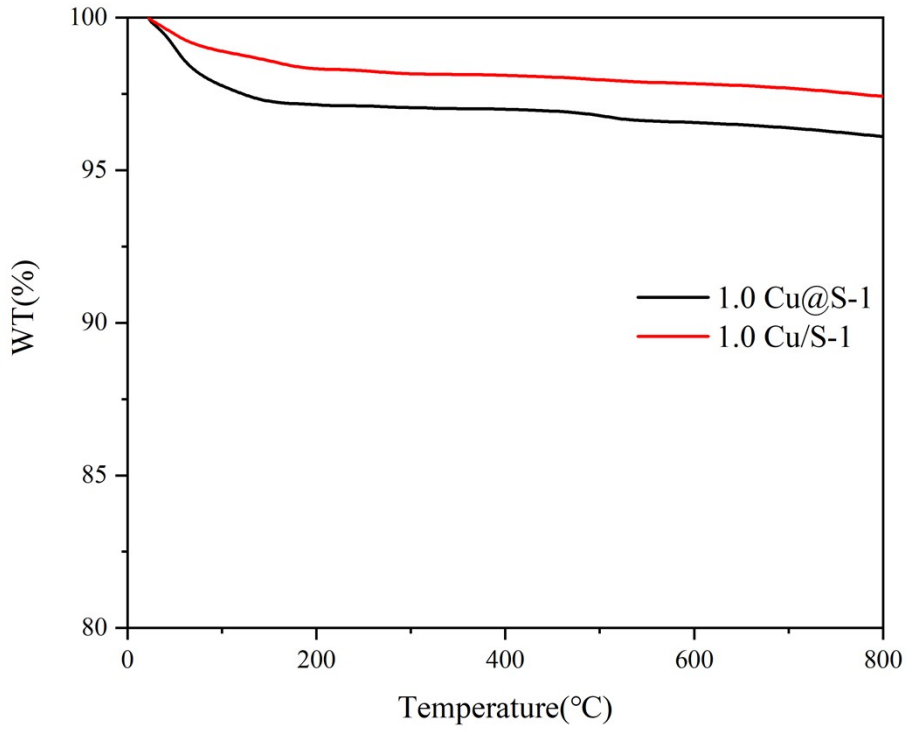

Fig. S7. TGA results of the spent 1.0 Cu@S-1 and 1.0 Cu/S-1

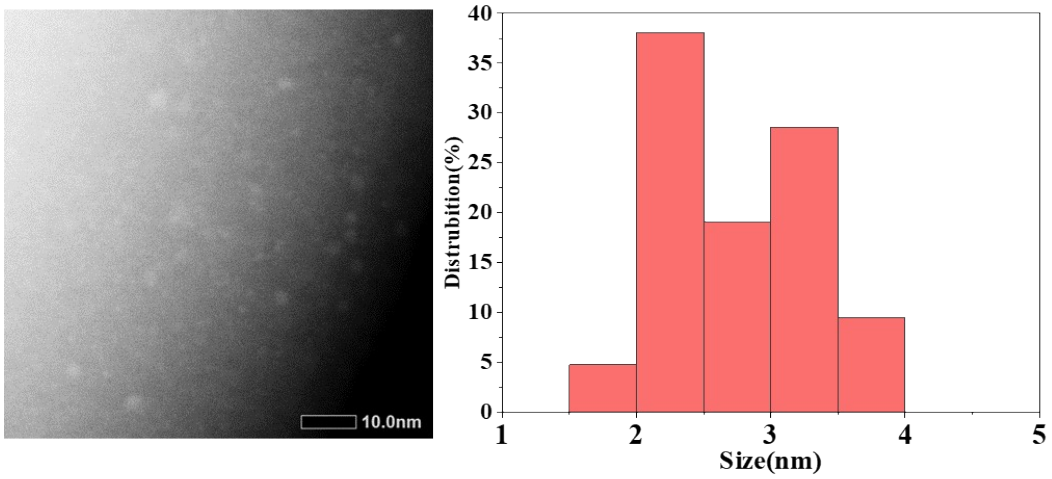

Fig. S8. HAADF-STEM image and corresponding Cu nanoparticles size distribution of the spent 1.0 Cu@S-1

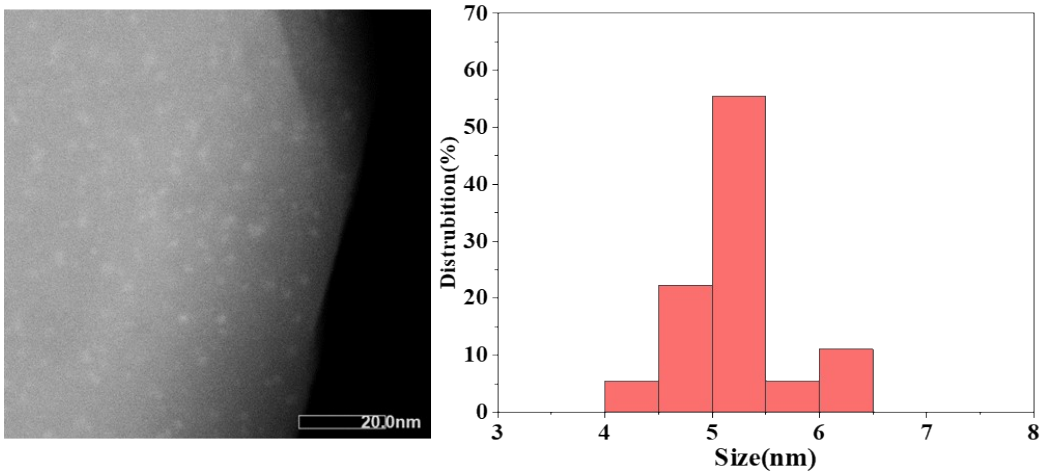

Fig. S9. HAADF-STEM image and corresponding Cu nanoparticles size distribution of the spent 1.0 Cu/S-1

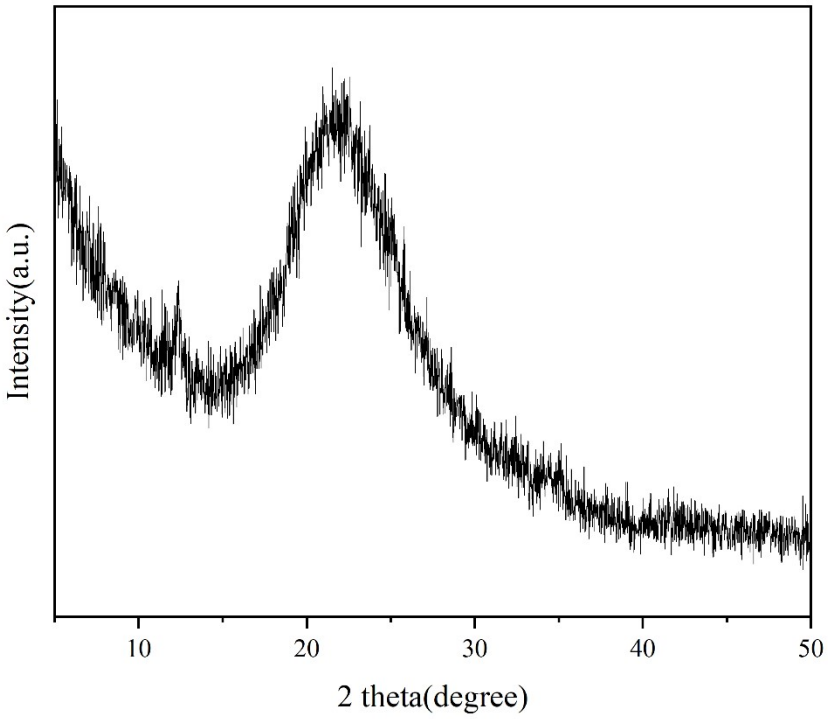

Fig. S10. The XRD pattern of the $CuZnO/SiO_2$.

Table S1 Cu loading and BET surface of the as-synthesized catalyst

Sample	Cu loading	Surface area[b]		Pore volume		D_{Cu}(%)
	wt%[a]	S_{BET}	S_{micro}	V_{micro}	V_{ext}	
0.25 Cu@S-1	0.26	324	227	0.11	0.08	-
0.50 Cu@S-1	0.53	350	228	0.12	0.08	-
0.75 Cu@S-1	0.73	368	246	0.11	0.08	-
1.0 Cu@S-1	1.05/1.05[c]	356	265	0.13	0.06	62.1
1.25 Cu@S-1	1.21	365	243	0.12	0.08	48.9
1.0 Cu/S-1	1.03	358	198	0.10	0.10	39.4
CuZnO/SiO_2	1.18/1.18[d]					

[a] Determined by XRF. [b] S_{BET}: BET surface area, S_{micro}: t-plot microporous surface area.

[c] Determined by ICP-OES analysis.

[d] the loading of Zn, determined by XRF