

Supplementary information

Dimethyl Ether Oxidation Over Copper Ferrite Catalysts

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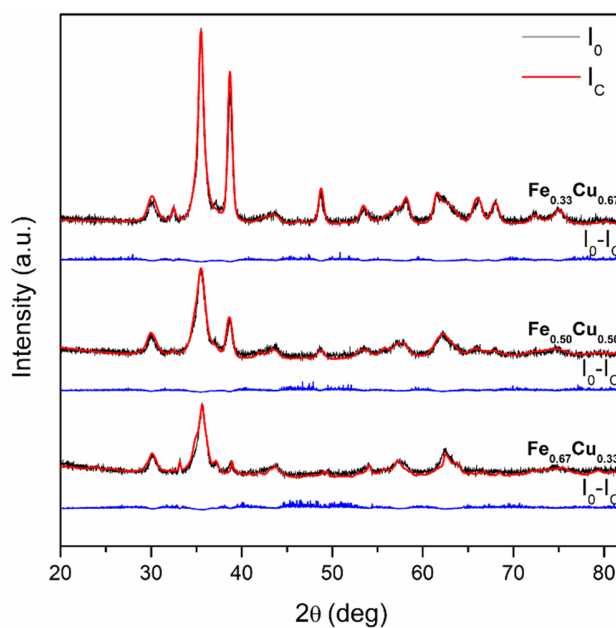


Figure S1. Rietveld refined XRD diffractograms of Fe_xCu_{1-x} catalysts. (I₀:observed, I_c:calculated, I₀-I_c: difference)

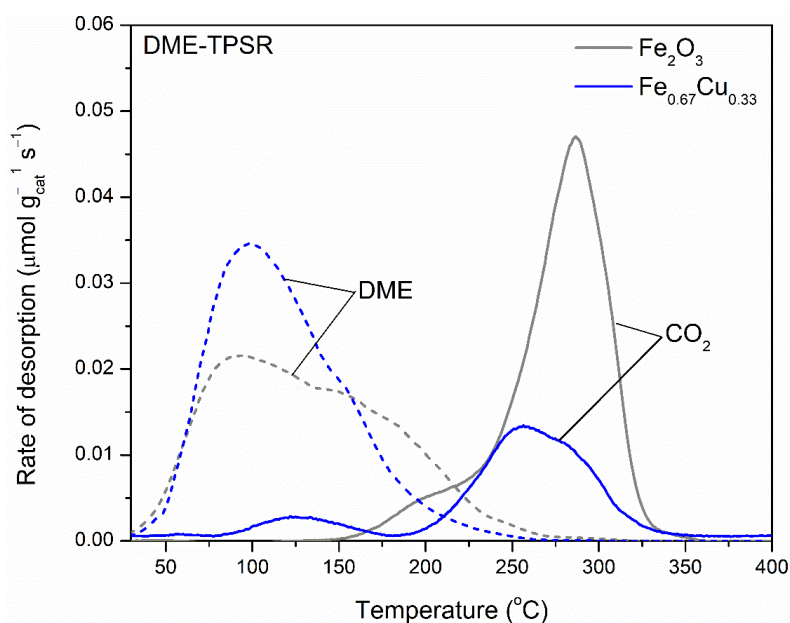


Figure S2. DME-TPSR profiles of $\text{Fe}_{0.67}\text{Cu}_{0.33}$ and Fe_2O_3 catalysts. Conditions: adsorption: 0.1% DME/He, carrier gas: 1% O_2 /He, flow: $30 \text{ cm}^3 \text{ min}^{-1}$.

Table S1. Amounts of desorbed DME and CO_2 expressed per catalyst weight and surface area over $\text{Fe}_x\text{Cu}_{1-x}$ catalysts ($0.33 \leq x \leq 0.67$) and single Fe_2O_3 and CuO oxides during DME-TPD and DME-TPSR experiments.

Catalyst	DME-TPD				DME-TPSR			
	$\mu\text{mol g}_{\text{cat}}^{-1}$		$\mu\text{mol m}^{-2}$		$\mu\text{mol g}_{\text{cat}}^{-1}$		$\mu\text{mol m}^{-2}$	
	DME	CO_2	DME	CO_2	DME	CO_2	DME	CO_2
Fe_2O_3	23.6	13.5	1.39	0.79	17.6	22.1	1.04	1.30
$\text{Fe}_{0.67}\text{Cu}_{0.33}$	17.6	7.6	0.53	0.23	18.9	12.8	0.57	0.39
$\text{Fe}_{0.50}\text{Cu}_{0.50}$	21.1	6.8	0.68	0.22				
$\text{Fe}_{0.33}\text{Cu}_{0.67}$	7.3	3	0.43	0.18				
CuO	-	0.8	-	0.53				

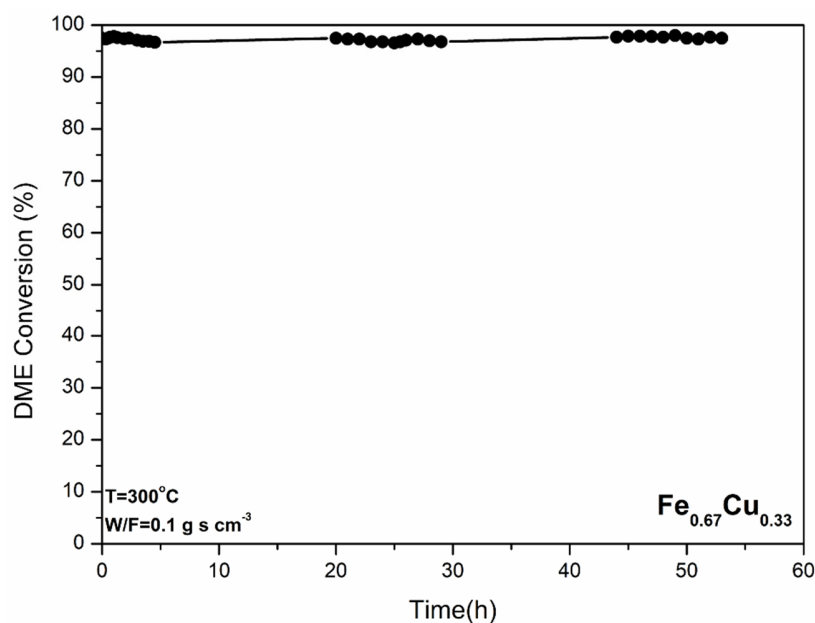


Figure S3. Stability test of $\text{Fe}_{0.67}\text{Cu}_{0.33}$ catalyst. Reaction conditions: 900 ppm DME and 8% O_2 , $T=300^\circ\text{C}$, $W/F = 0.1 \text{ g s cm}^{-3}$

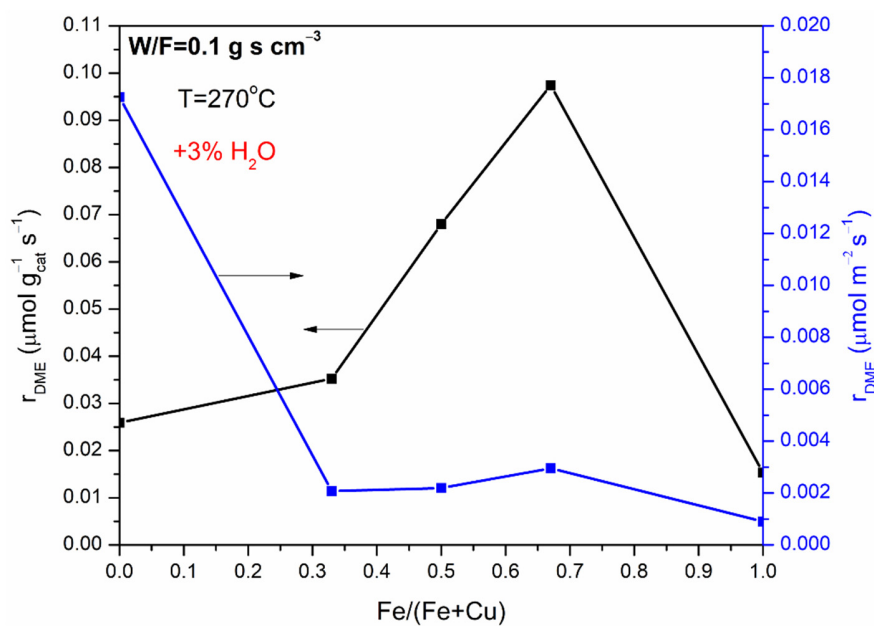


Figure S4. Variation of DME oxidation rates in the presence of H_2O vapor expressed per catalyst weight (in $\mu\text{mol g}_{\text{cat}}^{-1} \text{s}^{-1}$, left axis) and specific reaction rates (in $\mu\text{mol m}^{-2} \text{s}^{-1}$, right axis) with the $\text{Fe}/(\text{Fe} + \text{Cu})$ molar ratio. Reaction conditions: 900 ppm DME 8% O_2 and 3% H_2O , reaction temperature= 270°C , $W/F = 0.1 \text{ g s cm}^{-3}$.

DME oxidation over metal oxide catalysts is scarcely reported in the literature. Nevertheless, based on the reported results, we have calculated the specific reaction rates in DME oxidation and the results are summarized in Table S2.

Table S2. Summary of the literature in DME oxidation over (mixed) oxide catalysts.

Catalyst	Feed	GHSV (cm ³ g ⁻¹ h ⁻¹)	S _{BET} (m ² g ⁻¹)	T ₁₀ (°C)	T ₉₀ (°C)	Specific reaction rate (nmol m ⁻² s ⁻¹)	Ref.
α-MnO ₂	2% DME, 20% O ₂	30000	53	170	240	14 (170 °C)	[5]
CoFe ₂ O ₄	1% CO, 10% O ₂	45000	-	280	400	n.d.	[34]
Meso-TiO ₂	2% DME, 20% O ₂	24000	125	310	n.d. (360 °C, X _{DME} = 30%)	0.5 (240 °C)	[15]
Meso-ZrO ₂	2% DME, 20% O ₂	24000	142	315	n.d. (360 °C, X _{DME} = 30%)	1.3 (280 °C)	[15]
Meso-CeO ₂ - TiO ₂	2% DME, 20% O ₂	24000	103	280	n.d. (360 °C, X _{DME} = 75%)	1.7 (240 °C)	[15]
Meso-CeO ₂ - ZrO ₂	2% DME, 20% O ₂	24000	124	290	n.d. (360 °C, X _{DME} = 65%)	2.4 (280 °C)	[15]
Cu ₂ Mn ₁ /Al ₂ O ₃	1.5% DME, 20% O ₂	10000	177	250	340	0.6 (240 °C)	[7]
Fe _{0.67} Cu _{0.33}	0.09% DME, 8% O ₂	36000	33	220	290	2.4 (240 °C)	This work

n.d.=not determined