

Supplementary Materials

Table S1. Decomposition reaction that may occur in the course SCS synthesis with $\text{Mn}(\text{NO}_3)_2$ and various fuels. .

Component	Reactions	Conditions	Heat effect (kJ/mol)	Reference
Mn(II) nitrate, $\text{Mn}(\text{NO}_3)_2$	$\text{Mn}(\text{NO}_3)_2 \rightarrow$	ca.240 °C	155 ± 12	[1,2]
	$[\text{MnONO}_3] + \text{NO}_2 \rightarrow \text{MnO}_2 + 2\text{NO}_2$			
	$\text{MnO}_2 \rightarrow \text{Mn}_2\text{O}_3$	560-570 °C	≈24	
	$\text{Mn}_2\text{O}_3 \rightarrow \text{Mn}_3\text{O}_4$	above 800 °C	/	
Glycine, $\text{C}_2\text{H}_5\text{NO}_2$	$4\text{C}_2\text{H}_5\text{NO}_2 + 9\text{O}_2 \rightarrow$	210 °C	-972.98 ± 0.12	[3]
	$5\text{H}_2\text{O} + 4\text{CO}_2 + \text{N}_2$			
	$4\text{C}_2\text{H}_5\text{NO}_2 \rightarrow$	250 °C, no	-528	[4]
	$6\text{H}_2\text{O} + 2\text{NH}_3 + 6\text{C} + 2\text{HNCO}$	O_2		

Table S2. Overview of studies of SCS synthesis of Mn oxides.

Precursor	Fuel	Product	Conditions	Reference
$\text{Mn}(\text{NO}_3)_2$	Glycine	$\varepsilon\text{-MnO}_2$, 23 m ² /g	Heating plate evaporation/ignition; $\varphi = 0.5$	[5]
		$\varepsilon\text{-MnO}_2$, 43 m ² /g	$\varphi = 2.0$; higher φ results in better crystallinity	
$\text{Mn}(\text{NO}_3)_2$	Glyoxalic acid	$\text{Mn}_3\text{O}_4 + \text{Mn}_2\text{O}_3$, 43 m ² /g	Oven heating up to 120 °C (1h ramp, 1h hold), then annealing at 350 °C for 4h	[6]
	Ketoglutaric acid	$\text{Mn}_2\text{O}_3 + \text{Mn}_3\text{O}_4$, 23 m ² /g		
$\text{Mn}(\text{NO}_3)_2$	Glycine	Mn_2O_3 ; 43 m ² /g, 21 ± 4 nm	Oven heating at 600 °C for 20 min; $\varphi = 0.5$	[7]
		Mn_3O_4 ; 46 m ² /g, 17 ± 3 nm	500 °C, 30 min; $\varphi = 2$	
		$\text{Mn}_2\text{O}_3 + \text{MnO}_2$; 47 m ² /g	350 °C, 120 min, $\varphi = 2$	
$\text{Mn}(\text{NO}_3)_2$	Glycine	Mn_3O_4 ; 32 m ² /g	Slow evaporation in air, then heating plate ignition at 350 °C + x% of Vulcan	[8,9]
		$\text{Mn}_3\text{O}_4/\text{C}$; 5-35 nm		
MnAc_2	Ethanol	$\text{Mn}_3\text{O}_4(85\%) + \text{MnO}(15\%)$	Flame ignition of ethanol	[10]
$\text{Mn}(\text{NO}_3)_2$	Citric acid	MnO_2 , 6.3 m ² /g	Oven evaporation at 150 °C for 5h, then annealing at 400 °C for 3h in air; $\varphi = 0$	[11]
		$\text{Mn}_3\text{O}_4 + \text{Mn}_2\text{O}_3$, 15.3 m ² /g	$\varphi = 0.5$	
		Mn_3O_4 , 31.7 m ² /g	$\varphi = 1$	
		Mn_2O_3 , 55.1 m ² /g	$\varphi = 2$	
		$\text{Mn}_3\text{O}_4 + \text{Mn}_2\text{O}_3$, 38.2 m ² /g	$\varphi = 4$	
$\text{Mn}(\text{NO}_3)_2$	Urea	68%MnO ₂ + 32%Mn ₂ O ₃ , 7.5 m ² /g	330°C evaporation/ignition in oven	[12]
		32%MnO ₂ + 68%Mn ₂ O ₃	$\varphi = 0.2$	
		22%MnO ₂ + 78%Mn ₂ O ₃	$\varphi = 0.3$	
		Mn_2O_3 , 68 ± 12 nm	$\varphi = 0.4$	
		65%Mn ₃ O ₄ + 35%MnO	$\varphi = 1$	
	Glycine	Mn_2O_3	$\varphi = 2$	
		Mn_2O_3	$\varphi = 0.2$	
		Mn_2O_3	$\varphi = 0.3$	
		Mn_3O_4	$\varphi = 0.5$	
		Mn_3O_4	$\varphi = 1$	
		Mn_3O_4	$\varphi = 2$	

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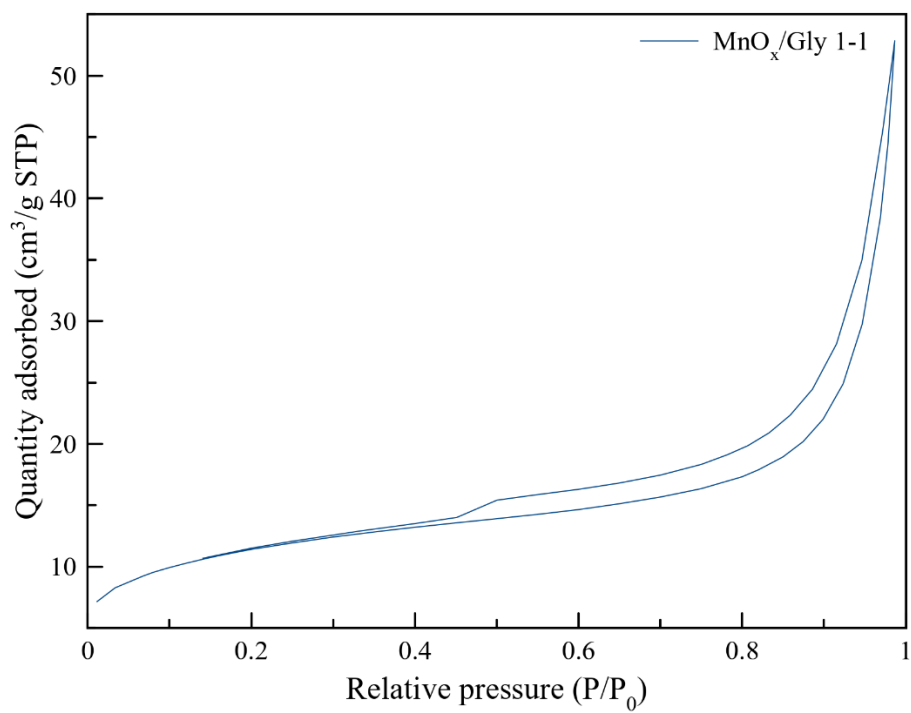


Figure S1. N₂ isotherm of the MnO_x/glycine sample.

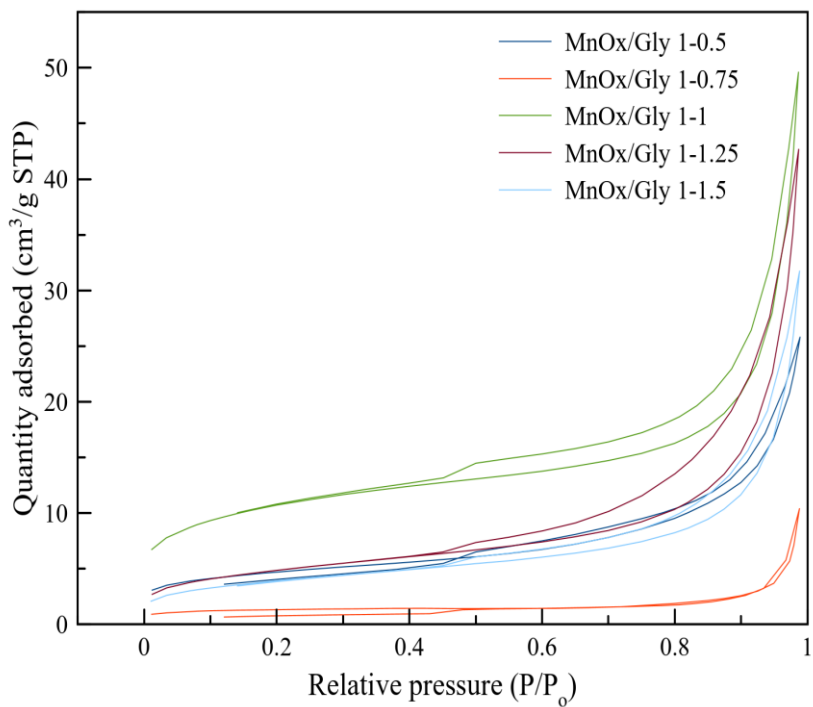


Figure S2. N₂ isotherm of the MnO_x/glycine samples with different φ ratios.

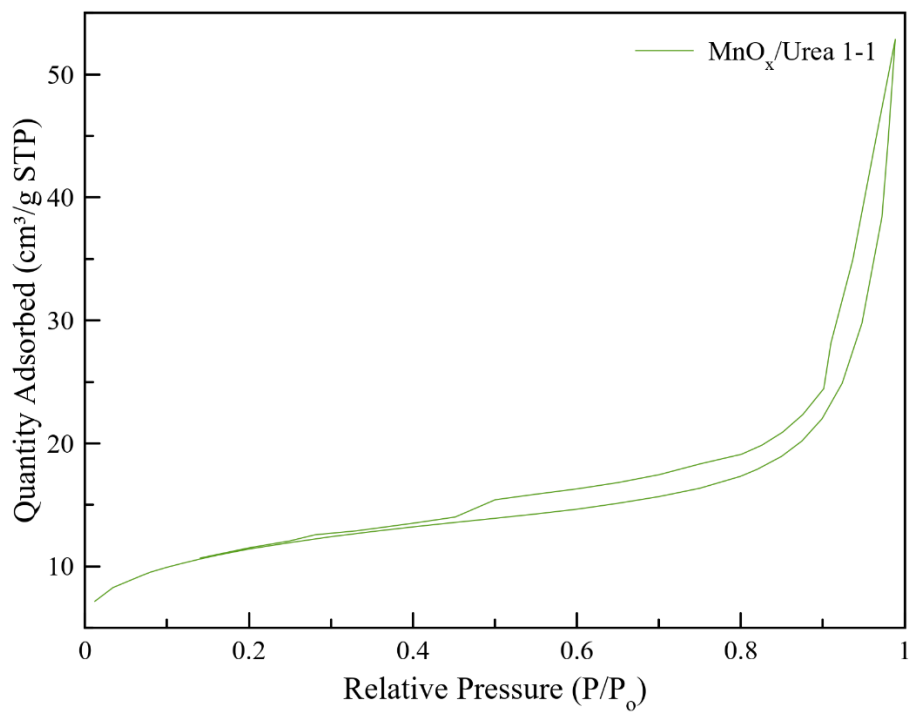


Figure S3. N₂ isotherm of the MnO_x/urea sample.

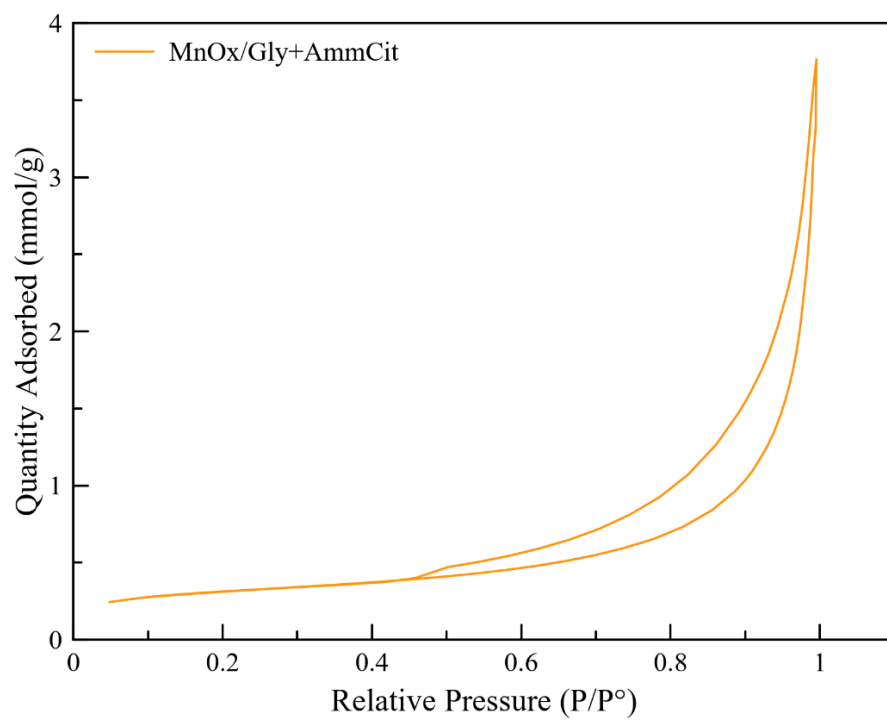


Figure S4. N₂ isotherm of the MnO_x/glycine–ammonium citrate sample.

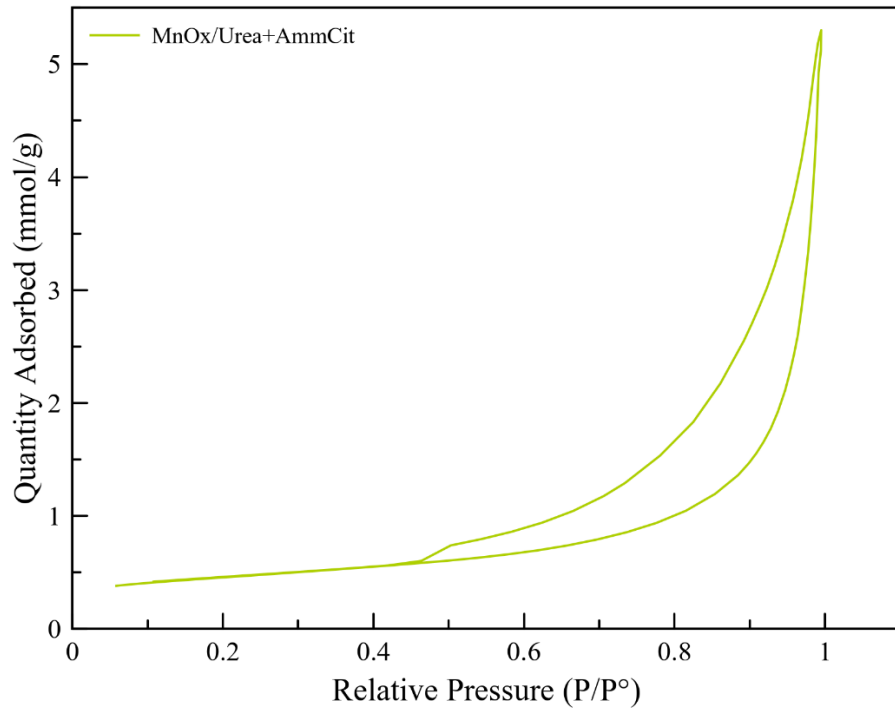


Figure S5. N₂ isotherm of the MnOx/urea–ammonium citrate sample

The analysis of the surface-controlled and diffusion-controlled contribution to the CV currents, j , has been performed using Dunn's method. Namely, the dependence of CV currents, j , on the sweep rate, v , has been presented as:

$$j = k_1 v^{1/2} + k_2 v, \quad (\text{S1})$$

where k_1 and k_2 are v -independent parameters. The first and second members of the sum correspond to diffusion-controlled and surface-controlled contributions to the current. The parameters k_1 and k_2 can be found as a slope and as intercept points of the linear dependence of j/v on $1/(\sqrt{v})$:

$$\frac{j}{v} = \frac{k_1}{v^{1/2}} + k_2. \quad (\text{S2})$$

The data for the Dunn's analysis are plotted below in Figure S6.

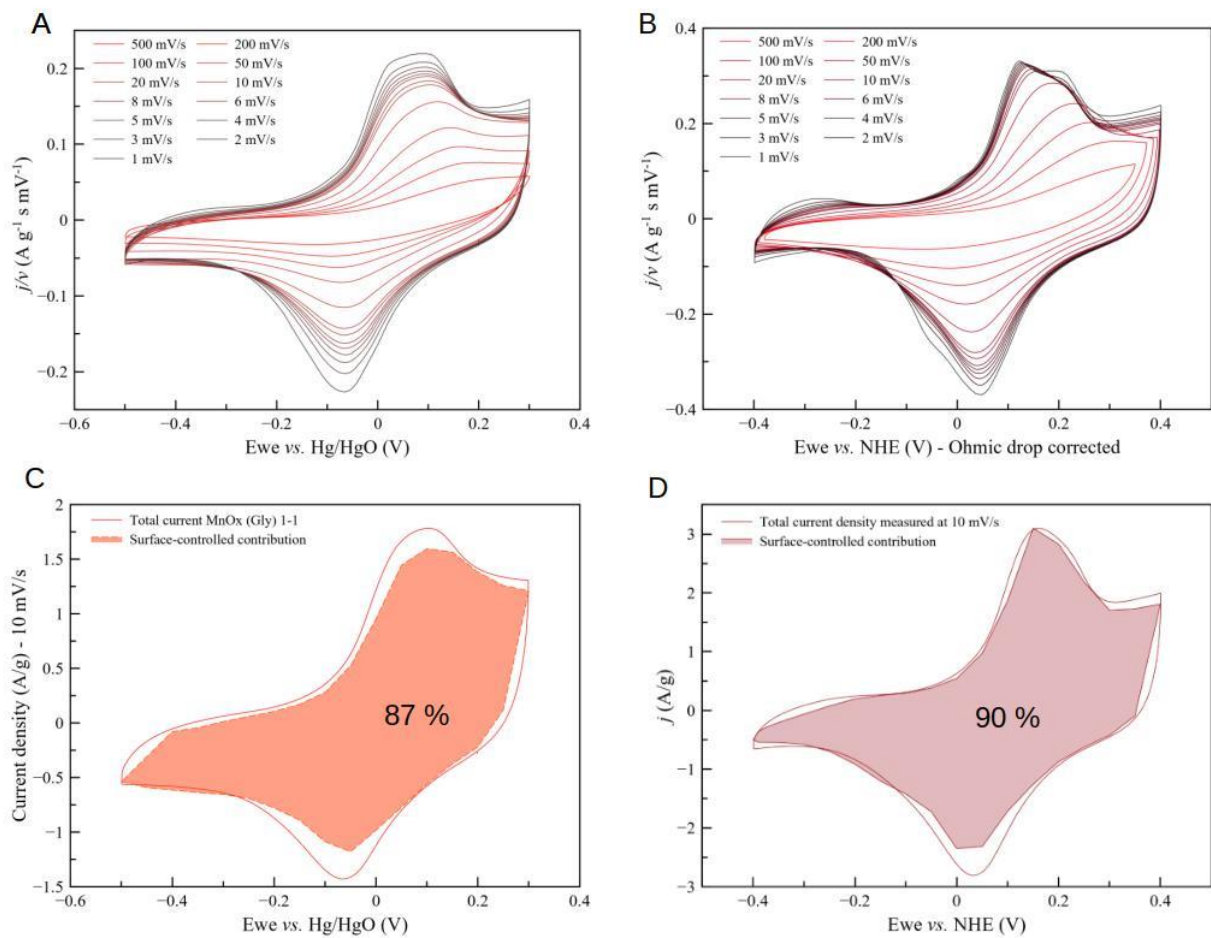


Figure S6. The CV curves for MnOx-NG (A) and MnOx-NCU (B) samples in 1 M NaOH recorded at different sweep rates. The CV curves containing only the current contribution linear to sweep rate are depicted below for MnOx-NG (C) and MnOx-NCU (D) as a filled area figure.