catalysts

MDPI

Supplementary Materials

Exploring Simultaneous Upgrading and Purification of Biomass–Gasified Gases Using Plasma Catalysis

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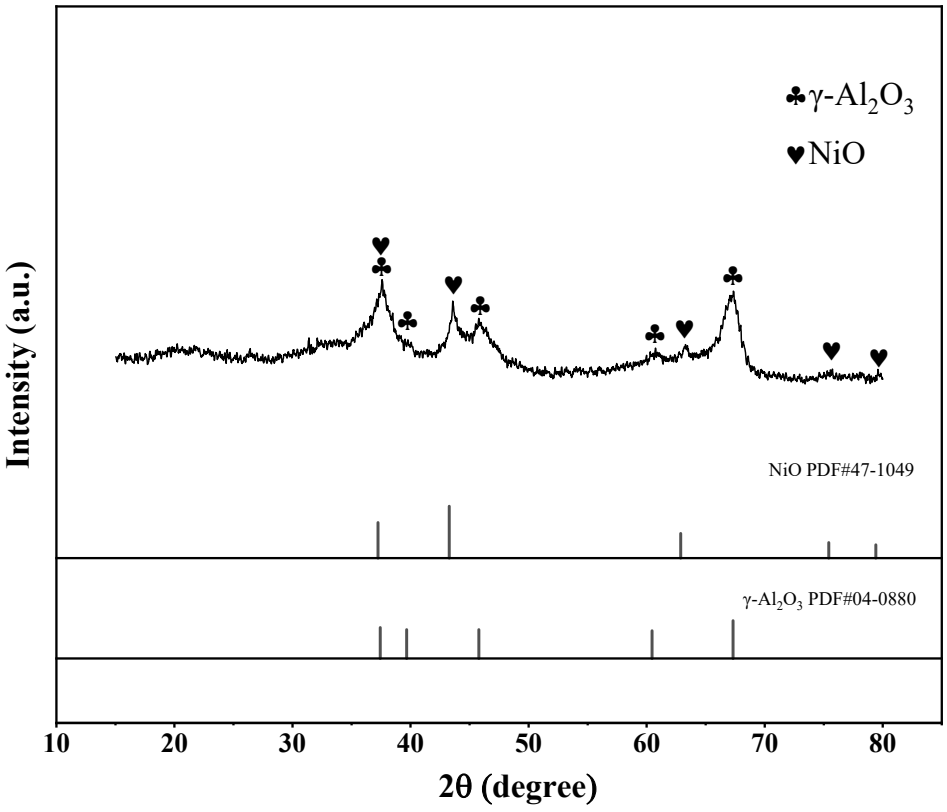
Figure S6. Schematic diagram of the experimental setup.



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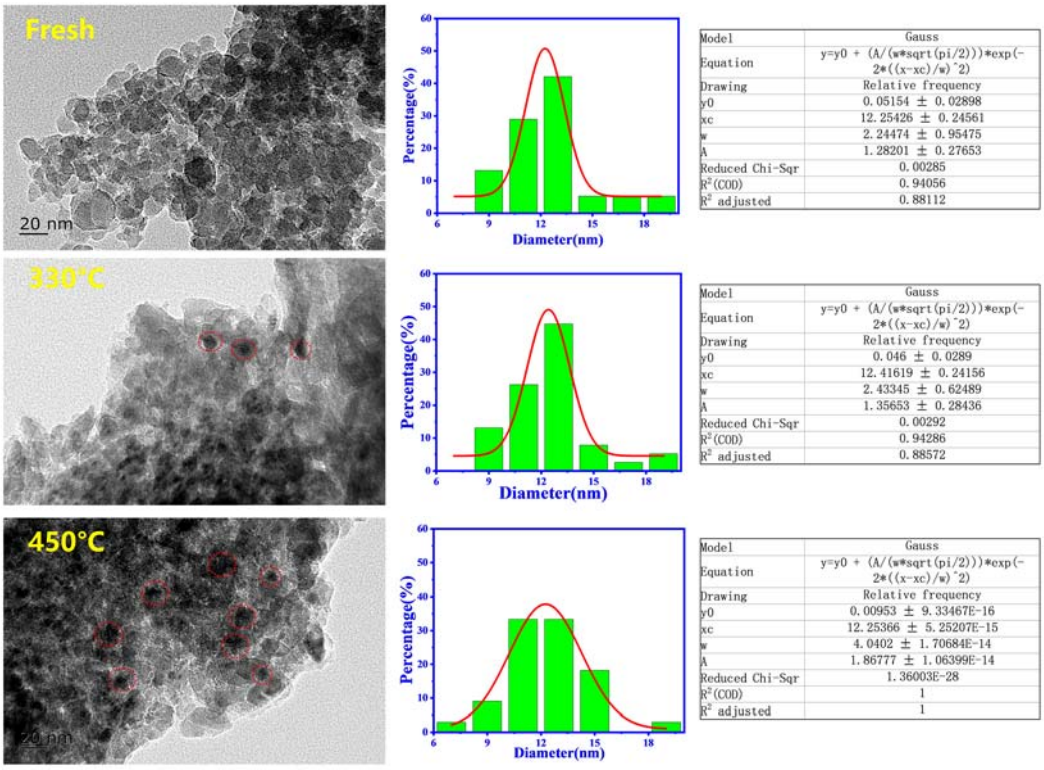

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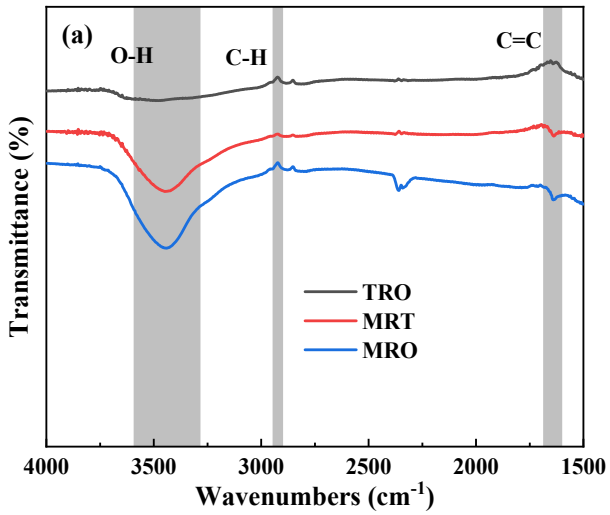

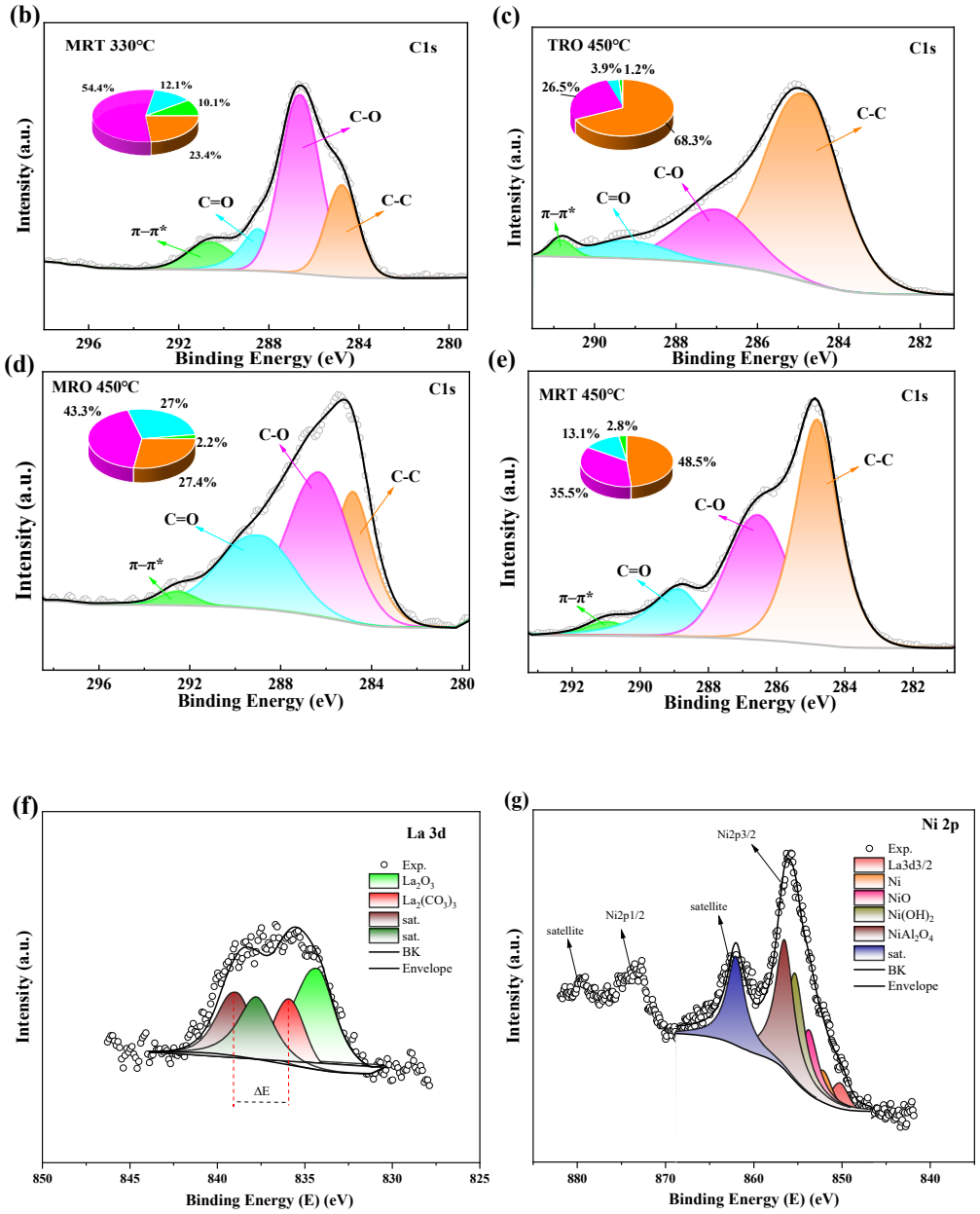

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Table S1. Relative contents of the peaks of the spent catalysts.

Samples	C–C (%)	C–O (%)	C=O (%)	O content (%)	π–π* (%)
MRT–330	23.4	54.4	12.1	66.5	10.1
MRT–450	48.5	35.5	13.1	48.6	2.8
MRO–450	27.4	43.3	27.0	70.3	2.2
TRO–450	68.3	26.5	3.9	30.4	1.2

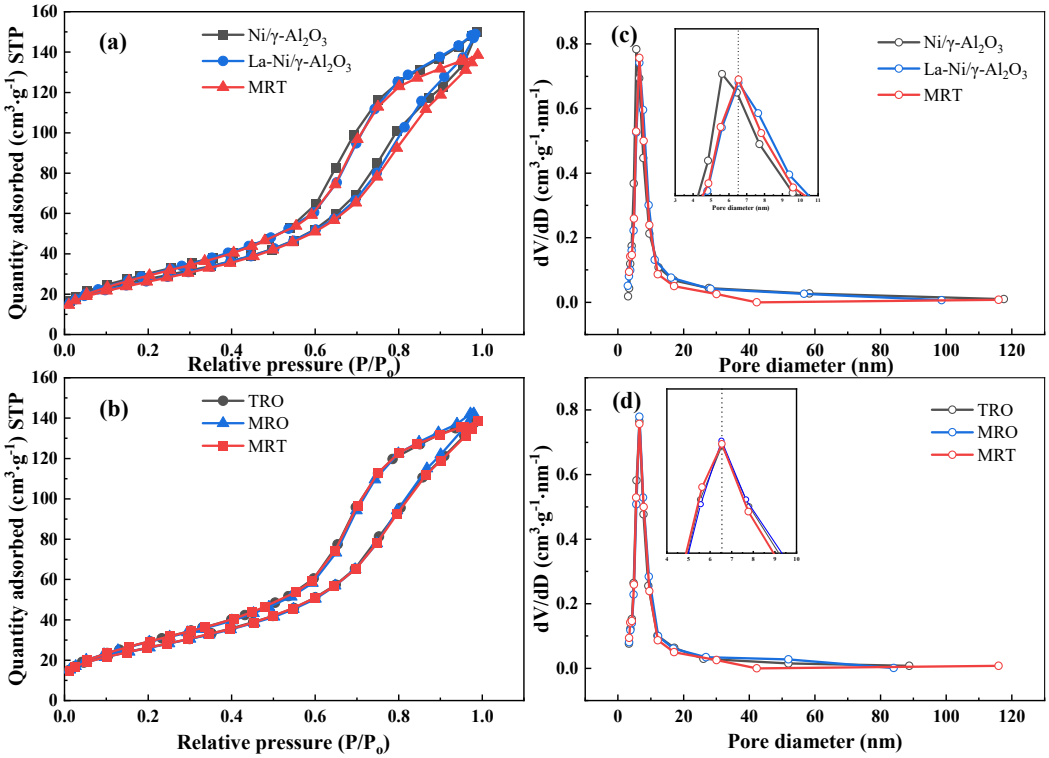
Table S2. H_2 molar flow from plasma−catalytic processes.

Process	Units	Temperature (°C)		
		250	288	330
MRT	mmol/min	0.56	0.38	0.43
MRO	mmol/min	0.89	0.95	1.05
TRO	mmol/min	0.09	0.11	0.12

Table S3. Catalyst characterization data.

Catalyst	BET specific surface area ($m^2 \cdot g^{-1}$)	Total pore volume ($cm^3 \cdot g^{-1}$)	Average pore size (nm)
γ−Al_2O_3	110.3	0.26	9.35
Ni/γ−Al_2O_3	99.1	0.23	9.35
La−Ni/γ−Al_2O_3	97.4	0.23	9.45
MRT	96.5	0.21	8.87
TRO	95.9	0.21	8.94
MRO	95.7	0.22	9.18

(MRT = Methane dry reforming with tar addition, MRO = Methane dry reforming−only, TRO = Tar removal−only) (Temperature: 450 °C, discharge power: 35 W, CO_2/CH_4 ratio: 1, total flow rate: 300 ml/min, tar concentration: 29.6 g/Nm^3, catalyst: 2%La−10%Ni/γ−Al_2O_3).



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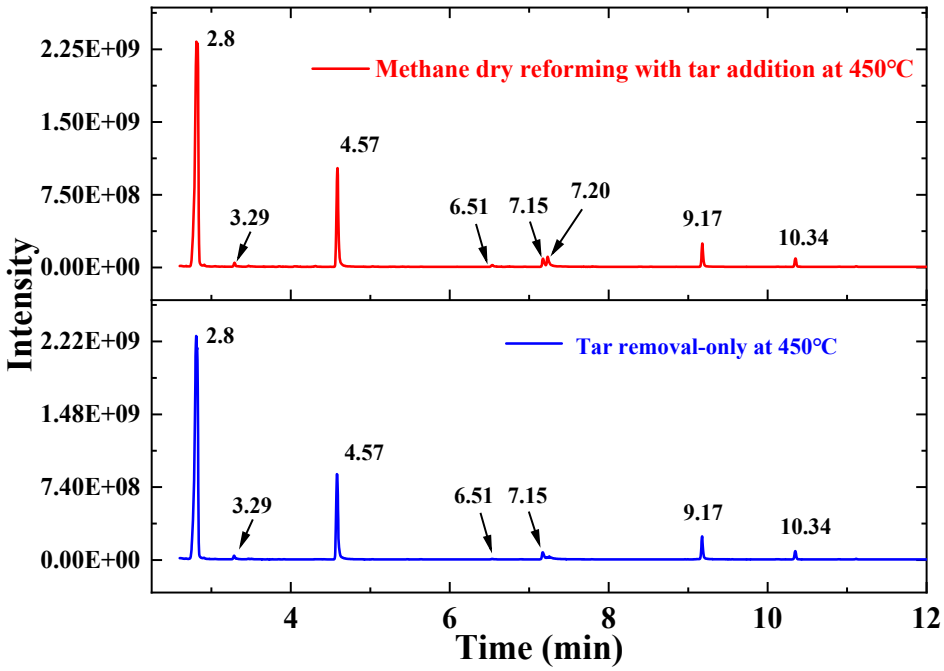
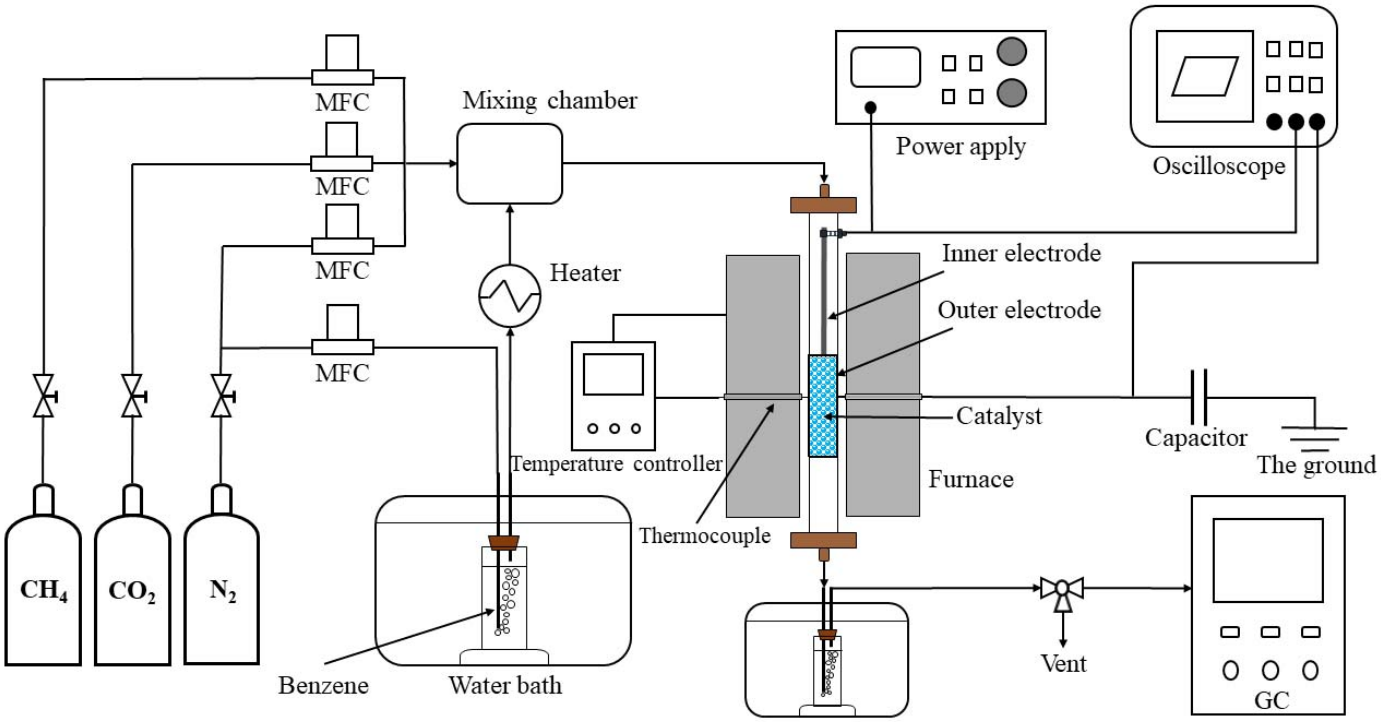


Figure S5. GC–MS spectrogram of benzene removal under a gas mixture (N_2, CH_4 and CO_2) atmosphere and a pure N_2 atmosphere.

Table S4. Main products identified in the liquid sample by GC–MS.

No.	R.T.(min)	M.W.	Formula	Compounds name	Structure	Peak Area (%)	
						MRT	TRO
1	2.8	78	C_6H_6	Benzene		71.68	73.28
2	3.29	100	C_7H_{16}	Heptane		0.61	0.62
3	4.57	92	C_7H_8	Toluene		18.05	16.86
4	6.51	106	C_8H_{10}	Ethylbenzene		0.44	0.13
5	7.15	104	C_8H_8	Styrene		1.6	1.47
6	7.20	128	$C_7H_{12}O_2$	2−Propenoic acid, butylester		1.9	/
7	9.17	142	$C_{10}H_{22}$	Decane		3.66	3.85
8	10.34	138	$C_{10}H_{18}$	trans−Decalin		1.37	1.38



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