Supporting Information

Role of Pr/Ni Loading Sequence in Boosting Photothermal Catalytic Activity of CeO_2 for Methane Dry Reforming

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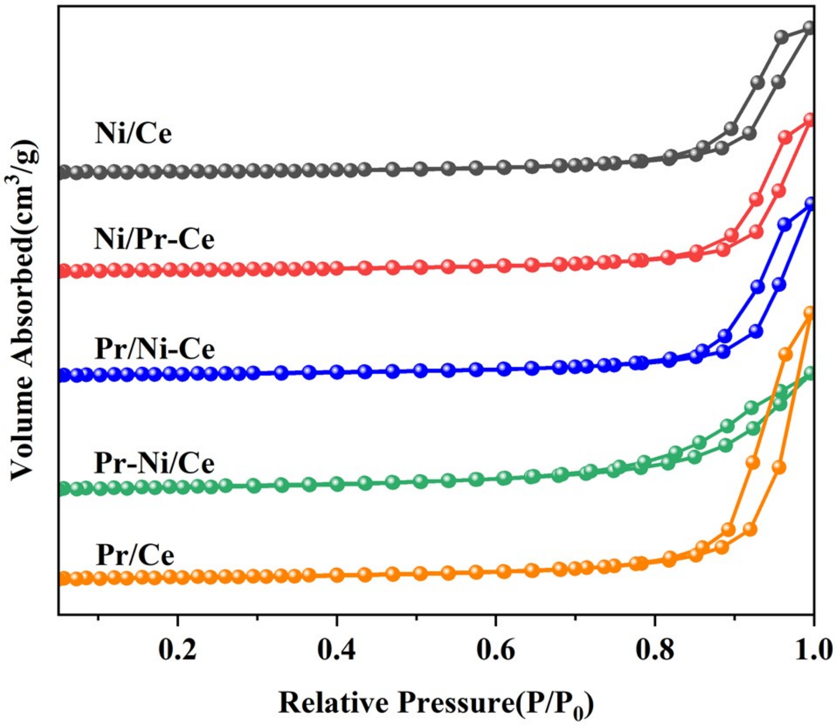

Fig. S1 Presents the N_2 adsorption-desorption isotherms for the Ni/Ce, Ni/Pr-Ce, Pr/Ni-Ce, Pr-Ni/Ce, and Pr/Ce catalysts.

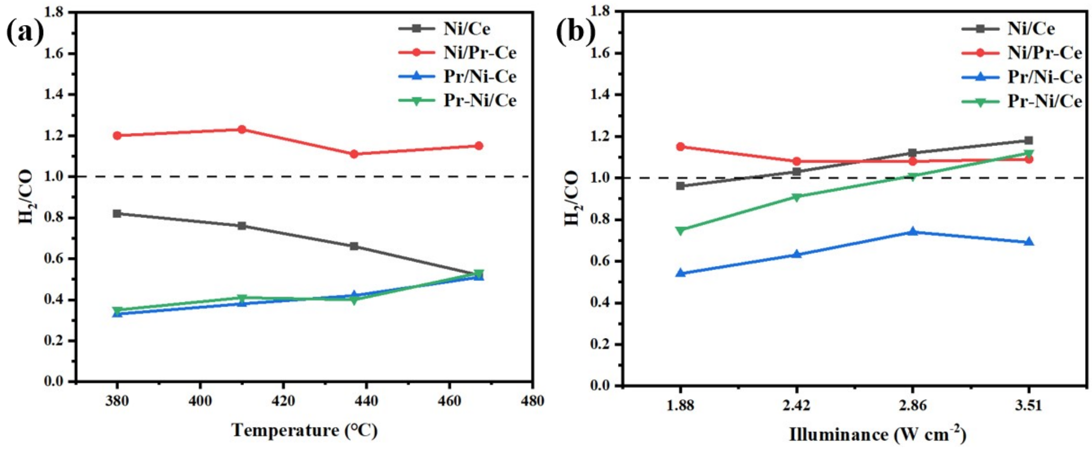

Fig. S2 Hydrogen-to-carbon ratio graphs: (a) under thermal catalytic conditions; (b) under photothermal catalytic conditions. Reaction conditions: 75 mg of catalyst; CH_4: CH_4: CO_2: Ar = 1:1:3, CH_4 concentration 20%, CO_2 concentration 20%; total gas flow rate: 20 sccm; tested light intensity 1.88-3.51 W cm^{-2}

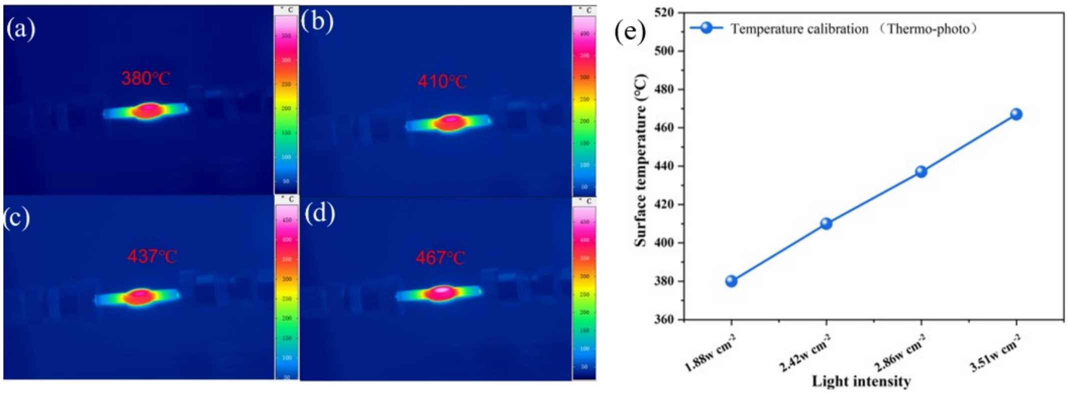

Fig. S3 Infrared thermal imaging images of the samples at different illumination intensities: (a) 1.88 W cm^{-2}; (b) 2.42 W cm^{-2}; (c) 2.86 W cm^{-2}; (d) 3.51 W cm^{-2}; (e) The corresponding actual temperatures of the samples under different illumination intensities.

Table S1 Mass Percentages (wt%) of Elements in the Samples

Number	Samples	ICP-OES		EDS	
		Loading amount of Ni (wt%)	Loading amount of Pr (wt%)	Loading amount of Ni (wt%)	Loading amount of Pr (wt%)
1	Ni/Ce	0.9	0.0	1.1	0.0
2	Ni/Pr-Ce	0.6	4.4	2.1	3.9
3	Pr/Ni-Ce	0.8	4.8	1.9	6.6
4	Pr-Ni/Ce	0.9	5.2	2.4	4.8
5	Pr/Ce	0.0	4.3	0.0	3.4

Table S2 Quantitative Analysis of Catalysts Based on XPS Results

Samples	O_V/（$O_V + O_L$）	Ce^{3+}/（$Ce^{3+} + Ce^{4+}$）	Pr^{3+}/（$Pr^{3+} + Pr^{4+}$）
Ni/Ce	0.43	0.17	/
Ni/Pr-Ce	0.63	0.31	0.51
Pr/Ni-Ce	0.61	0.18	0.44
Pr-Ni/Ce	0.62	0.26	0.45
Pr/Ce	0.41	0.15	0.38

Table S3 Catalyst Comparison for Catalytic Dry Reforming of Methane

Catalyst	Reactant condition	Driven energy	Conversion (%)	Ref.
Ni/Pr-Ce	$CH_4/CO_2/Ar=1/1/3$	300 W Xe	CO_2: 80.1% CH_4: 83.1%	This work
$Rh/SrTiO_3$	$CH_4/CO_2/Ar=1/1/98$	150 W Hg-Xe	CO_2: 55% CH_4: 52%	1
MgO/Pt/Zn-CeO_2	$CH_4/CO_2/Ar=1/1/8$	1200W Sciencetech 200-1K lamp	CO_2: 52.6% CH_4: 38.8%	2
$Cu_{19.8}Ru_{0.2}$	$CH_4/CO_2=1/1$	White light	CO_2: - CH_4: 35%	3
Ru_1/Mg-CeO_2-NR	$CH_4/CO_2/N_2=1/1/2$	300 W Xe	CO_2: 31% CH_4: 21%	4
Ni_{SA}/CeO_2	$CH_4/CO_2/Ar=1/1/3$	300 W Xe	CO_2: 16.5% CH_4:16.2%	5
CoNiRuRhPd/$SrTiO_3$	$CH_4/CO_2/Ar=1/1/8$	300 W Xe	CO_2: 13% CH_4: 12%	6

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