Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Thermal stable core-shell Ni/nanorod-CeO_2@SiO_2 catalyst for partial oxidation of methane at high temperatures

Shaohong Zhu, Xinyi Lian, Tingting Fan, Zhou Chen, Yunyun Dong, Weizheng Weng, Xiaodong Yi*, Weiping Fang

National Engineering Laboratory for Green Chemical Productions of Alcohols, Ethers and Esters, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, P. R. China. E-mail: xdyi@xmu.edu.cn

Table S1 Values of TOF_{CH4} for various POM catalysts

Catalysts	Metal loading （wt%）	Reaction temperature (℃)	CH_4 conversion (%)	Amount of H atoms adsorbed (μmol/g)	TOF (s^{-1})	References
$Ni/MgAl_2O_4$	10.0	800	79	10.8	37.6	16
Ni-350@meso-SiO_2	43.3	750	93	7.3	37.9	17
NiO/3HL-ZrO_2-SiO_2	9.9	800	92	–	0.035	18
Ni/SiO_2-GL	4.88	700	95	–	0.095	19
Rh–CeO_2/MgO	1.0	700	81	6.0	274	20
Rh–Co/MgO	0.3	700	76	3.7	420	21
2Pt-CeO_2^{NP}	2.0	400	92	8.1	770	22

Table S2 Texture parameters of the catalysts according to Ar sorption

catalysts	Surface area / $m^2 \cdot g^{-1}$	Average pore size /nm
Ni/NR-CeO_2	76	10.6
Ni/NR-CeO_2@SiO_2	60	20.3
Ni@SiO_2	138	18.6

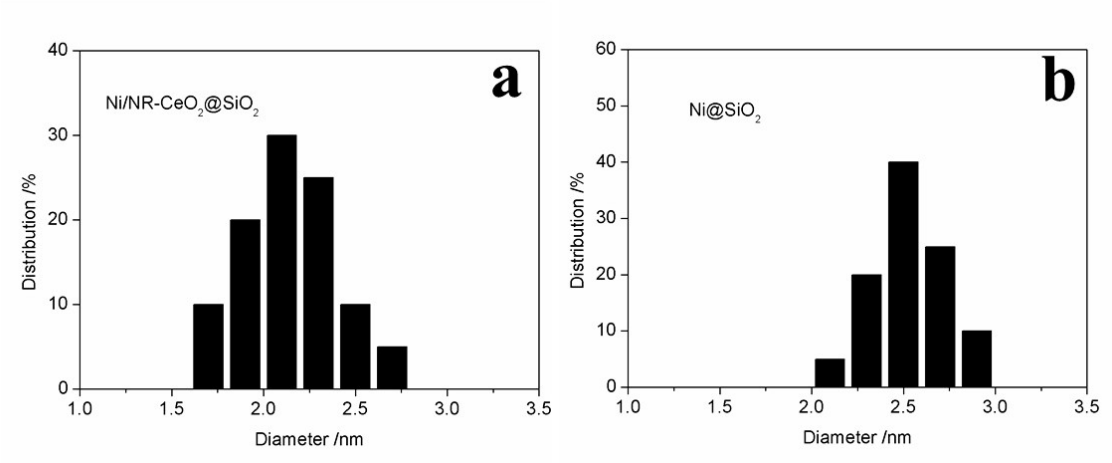

Fig. S1 NiO particle sizes distribution of (a) Ni/NR-CeO_2@SiO_2 and (b) Ni@SiO_2

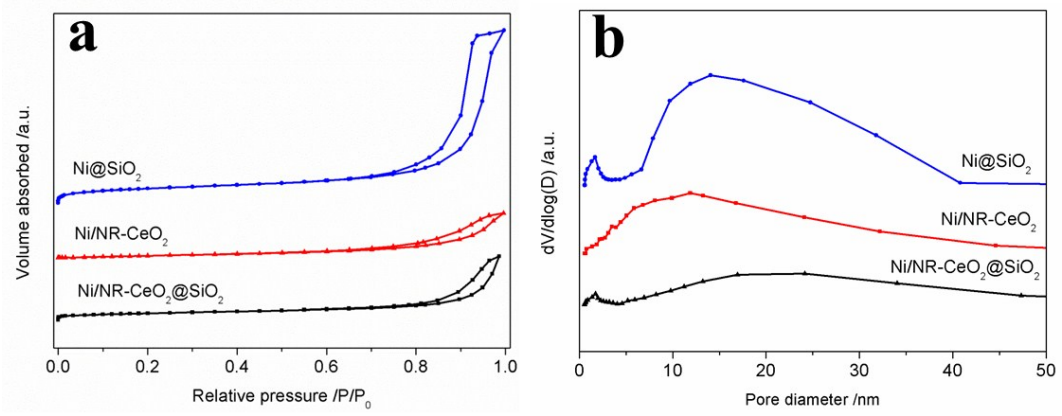

Fig. S2 (a) Ar adsorption−desorption isotherms and (b) pore size distribution curves of the catalysts

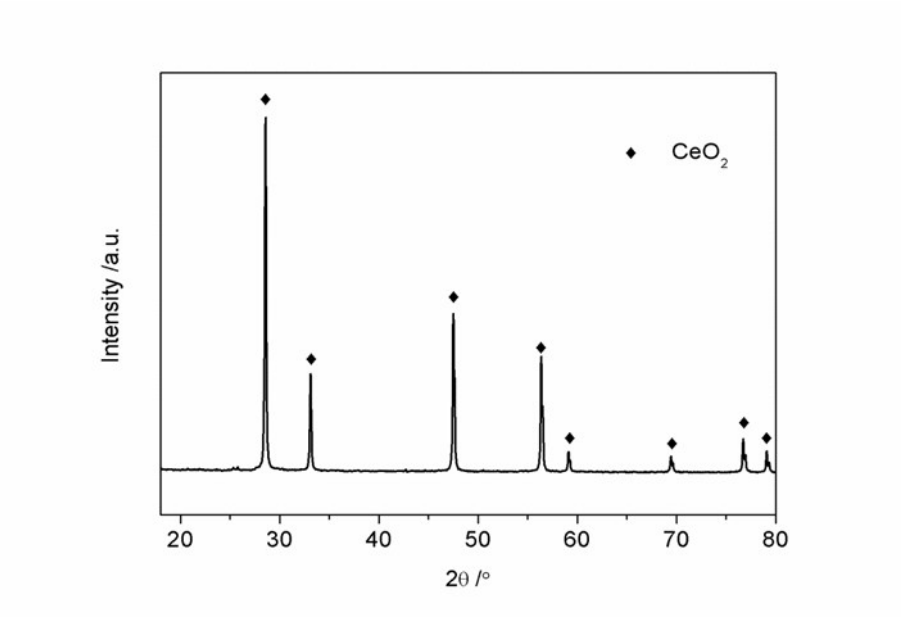

Fig. S3 XRD patterns of the commercial CeO_2

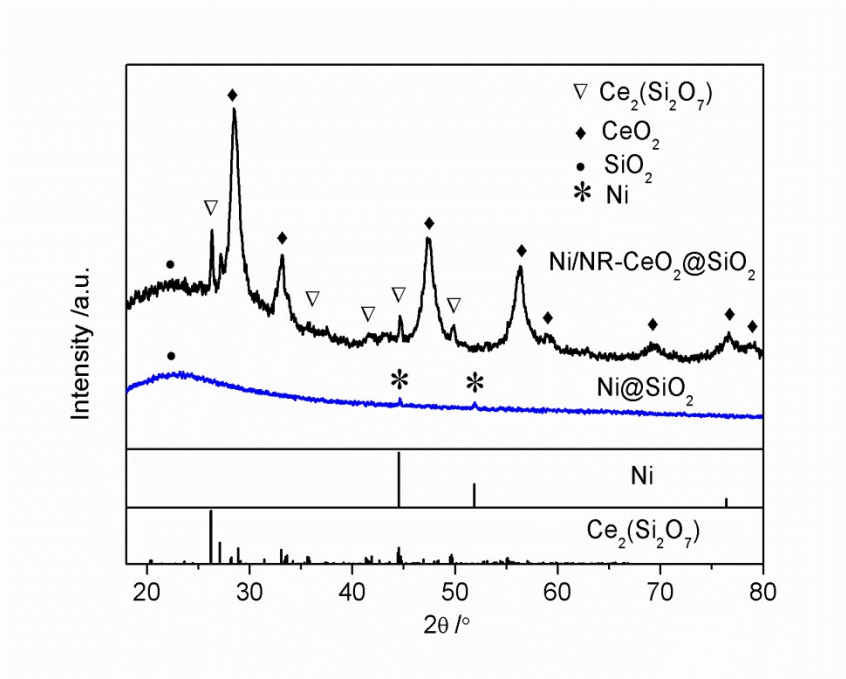

Fig. S4 XRD patterns of the Ni/NR-CeO_2@SiO_2 and Ni@SiO_2 catalysts reduced by H_2 at 750 °C for 1 h

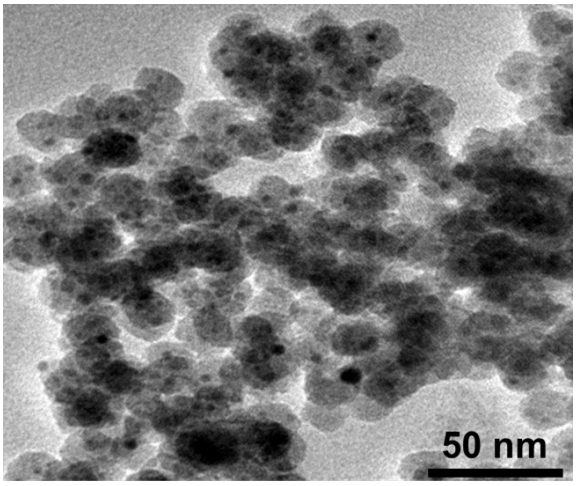

Fig. S5 The TEM image of the Ni@SiO_2 catalyst after the POM reaction

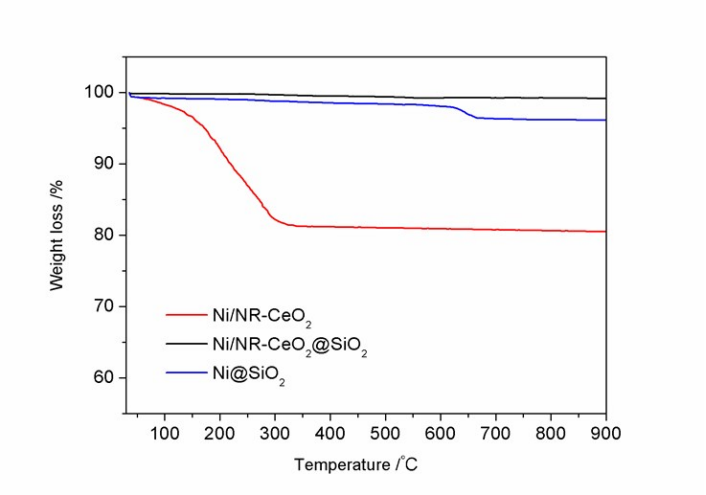

Fig. S6 TG profiles of the Ni/NR-CeO_2 and Ni/NR-CeO_2@SiO_2 catalysts after the POM reaction

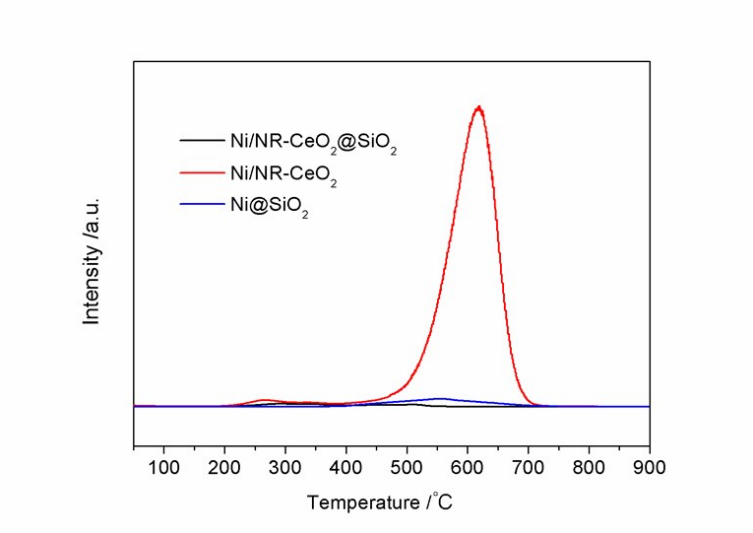

Fig. S7 TPO profiles of the Ni/NR-CeO_2 and Ni/NR-CeO_2@SiO_2 catalysts after the POM reaction