Supplemental Material for

Tar Reforming in Model Gasifier Effluents: Transition Metal / Rare Earth Oxide Catalysts

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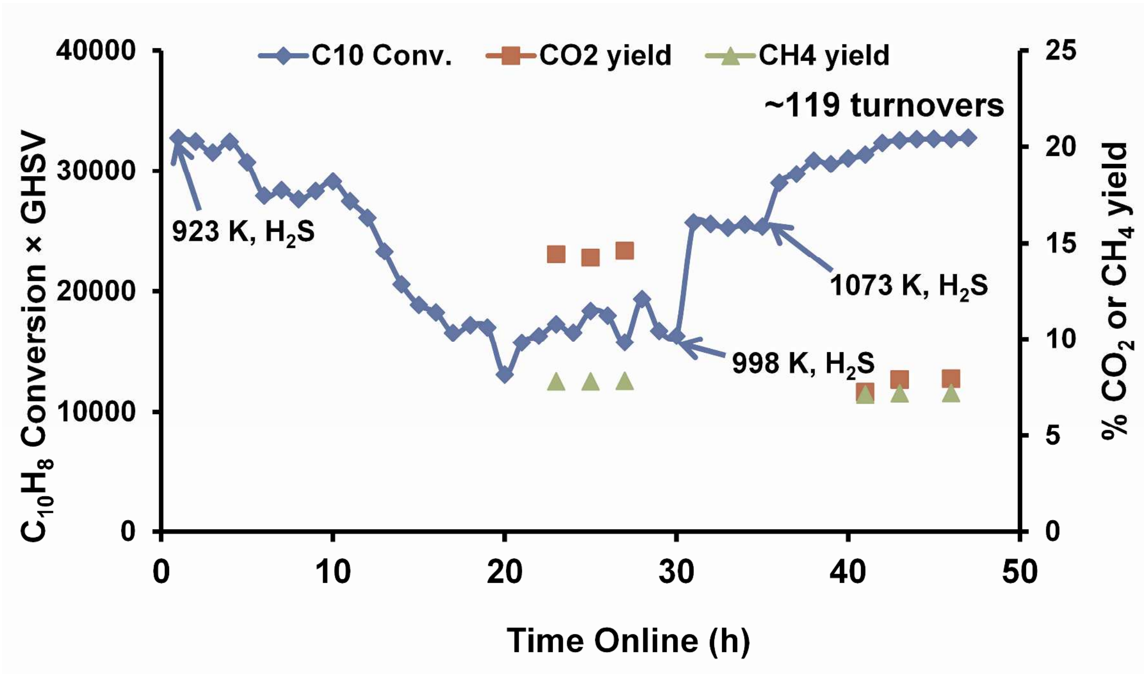

Figure S1. Tar reforming at 923 – 1073 K with Fe/Ce3/La/Al. Feed: H_2O 9.1%, CO 54.5%, CH_4 4.1%, H_2 30.9%, N_2 1.07%, $C_{10}H_8$ 0.33%, H_2S 40 ppm. Turnovers are calculated with respect to $C_{10}H_8$ only.

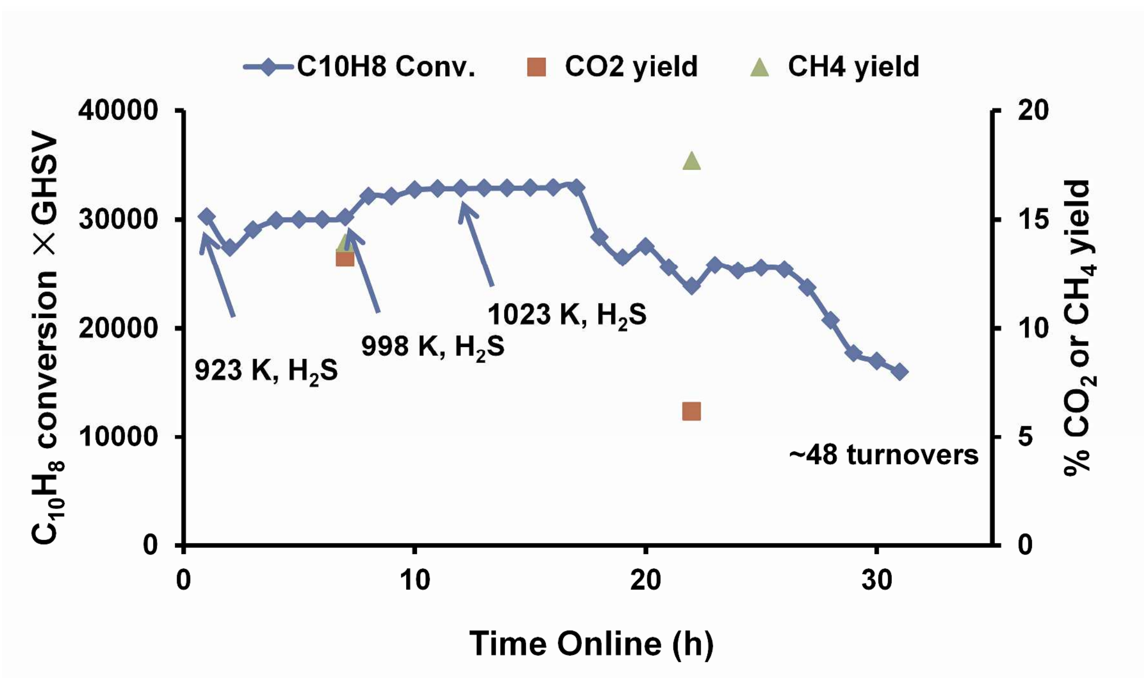

Figure S2. Tar reforming at 923 – 1073 K with Ni2/Ca/Mg2/Al. Feed: H_2O 9.1%, CO 54.5%, CH_4 4.1%, H_2 30.9%, N_2 1.07%, $C_{10}H_8$ 0.33%, H_2S 40 ppm. Turnovers are calculated with respect to $C_{10}H_8$ only.

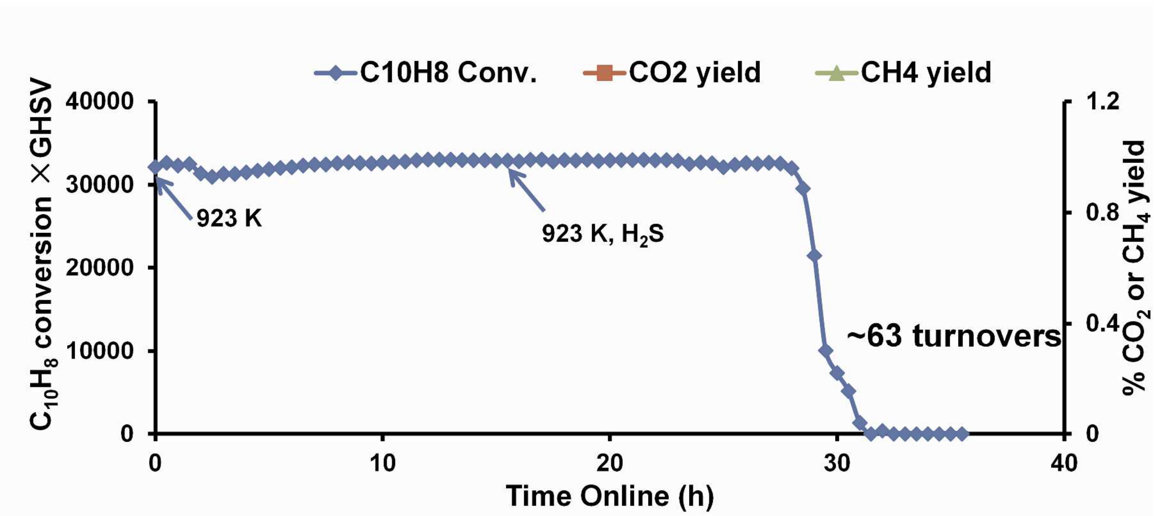

Figure S3. Tar reforming at 923 – 1073 K with Ni15/K/Mg4/Al. Feed: H_2O 9.1%, CO 54.5%, CH_4 4.1%, H_2 30.9%, N_2 1.07%, $C_{10}H_8$ 0.33%, H_2S 40 ppm. Turnovers are calculated with respect to $C_{10}H_8$ only.

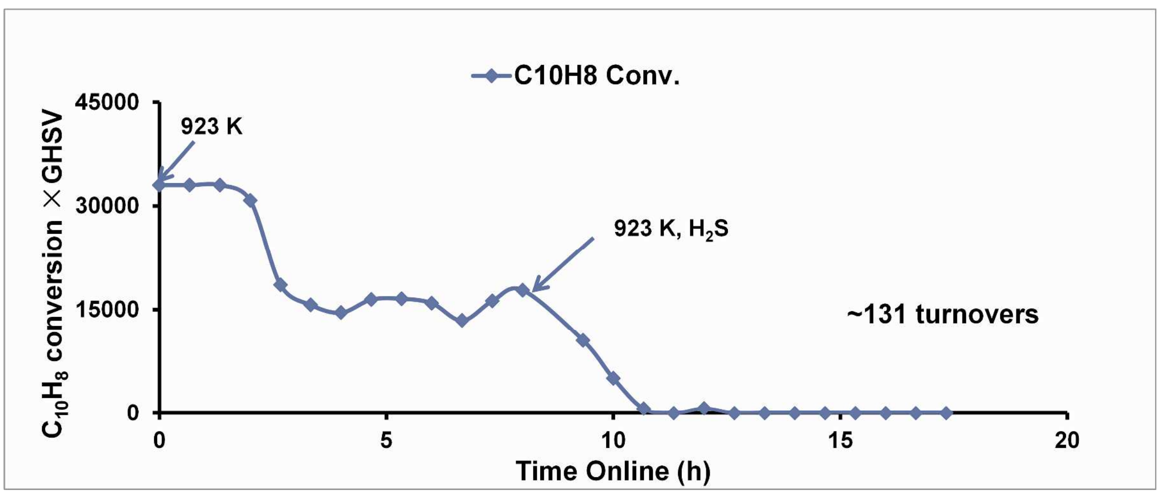

Figure S4. Tar reforming at 923 – 1073 K with Ni0.008/Mn0.003/Al. Feed: H_2O 9.1%, CO 54.5%, CH_4 4.1%, H_2 30.9%, N_2 1.07%, $C_{10}H_8$ 0.33%, H_2S 40 ppm. Turnovers are calculated with respect to $C_{10}H_8$ only.

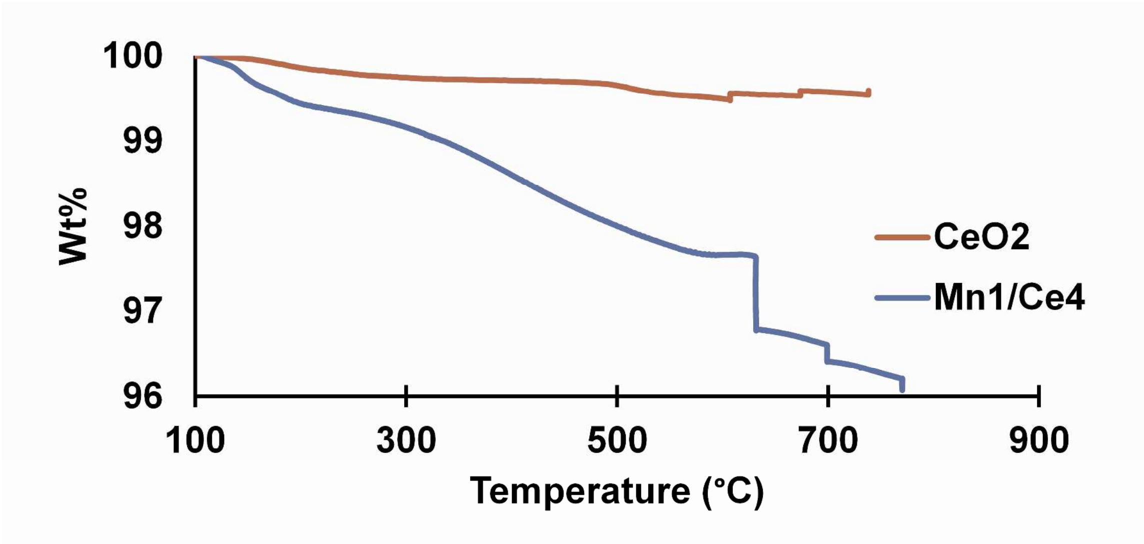

Figure S5. Weight loss in hydrogen temperature-programmed reduction of as-calcined (fresh) Mn1/Ce4 and CeO_2. The hold at 630ºC was for 2 h, and at 740 and 770ºC, 1 h.

The weight loss for Mn1/Ce4 is equivalent to ~17% reduction on an oxygen atom basis (O lost/all O in the sample), much higher than that of CeO_2 (~2.7%).

Table S1. Results of regression analysis for Ce L_{III}-edge XAFS of reduced Fe/Ce3

	Ce-O	Ce-Ce/Fe
N	6.7	9.3/2.7
R (Å)	2.27	3.77/3.75
σ^2(Å)	0.014	0.009/0.009
R-factor	0.06	

Table S2. Results of regression analysis for Fe K-edge XAFS of reduced Fe/Ce3

	Fe-O	Fe-Fe/Ce	Fe-Fe
N	6.4	2.6/9.3	8
R (Å)	2.27	3.7/3.74	2.47
σ^2(Å)	0.07	0.019/0.01	0.004
R-factor	0.06		

Table S3. Results of regression analysis for Ce L_{III}-edge XAFS of Mn1/Ce4, Ce-anion and Ce-cation shells

sulfided	Ce-O (S)[1]	Ce-Ce (Mn)	Ce-O (S)
N	6.4	12	17.8
R (Å)	2.33±0.02	3.86±0.02	4.37±0.08
σ^2(Å)	0.010±0.002	0.006±0.002	0.016±0.031
reduced	Ce-O (S)	Ce-Ce (Mn)	Ce-O (S)
N	6	12	15
R (Å)	2.33±0.03	3.88±0.02	4.39±0.04
σ^2(Å)	0.015±0.004	0.004±0.003	0.003±0.021
as calcined	Ce-O (S)	Ce-Ce (Mn)	Ce-O (S)
N	6.8	12	18.2
R (Å)	2.33±0.02	3.86±0.02	4.38±0.09
σ^2(Å)	0.009±0.002	0.006±0.002	0.020±0.04