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Supporting Information for:

One-Pot Synthesis of Highly Mesoporous Ni/$MgAl_2O_4$ Spinel Catalyst for Efficient Steam-Methane Reforming: Influence of Inert Annealing

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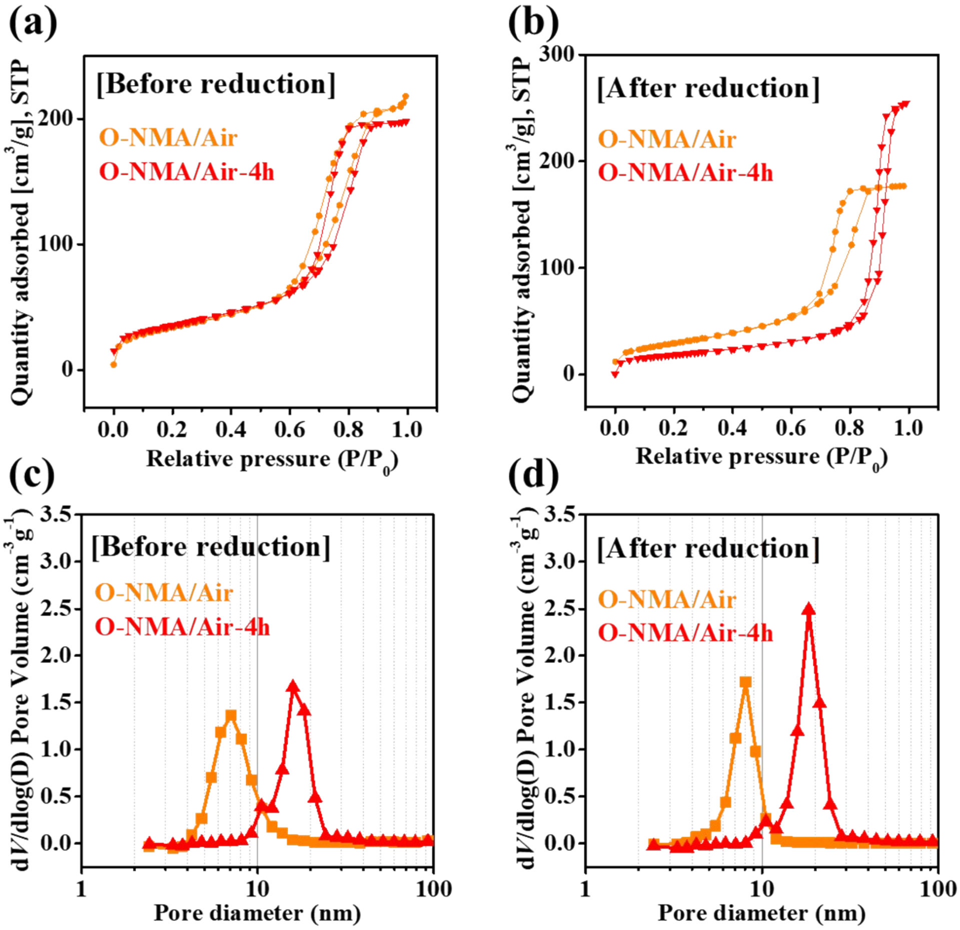

Fig. S1 – N_2 adsorption/desorption isotherms (a, b) and BJH pore-size distributions (c, d) of mesoporous $Ni/MgAl_2O_4$ catalysts subjected to calcination in air for 2.0 h and 4.0 h, before (a, c) and after reduction (b, d).

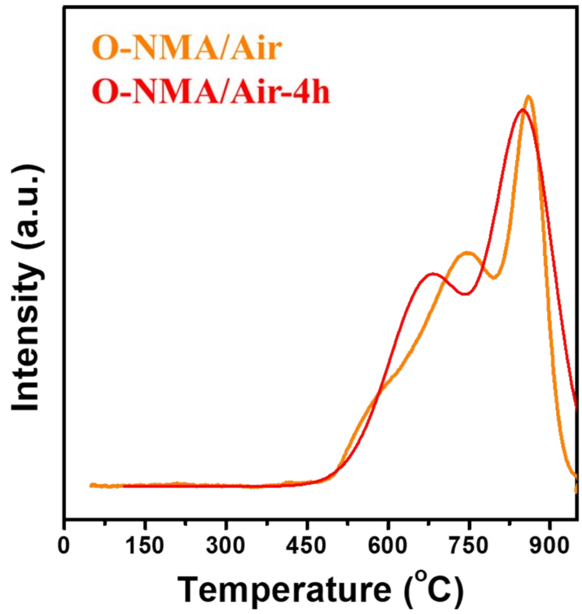

Fig. S2 – H_2–TPR of mesoporous Ni/$MgAl_2O_4$ catalysts subjected to calcination under air for 2.0 h and 4.0 h.

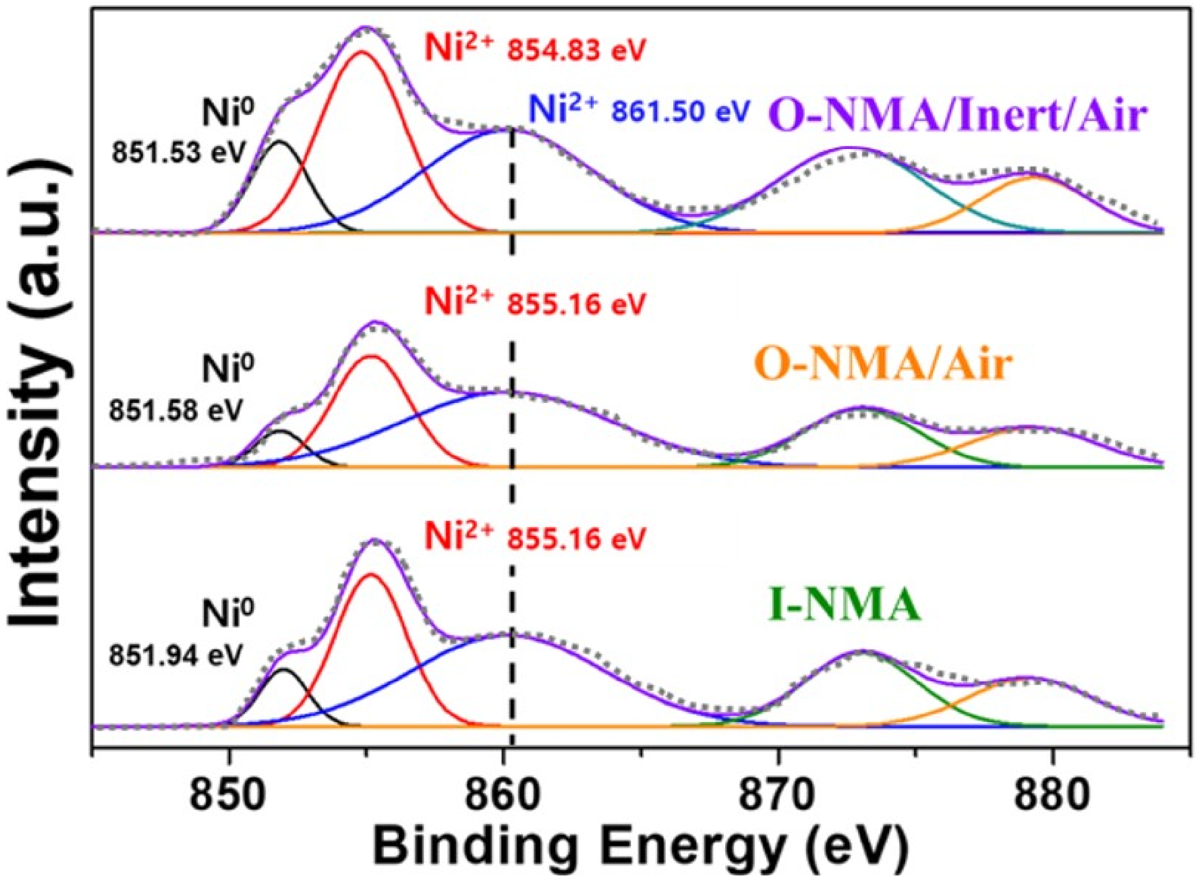

Fig. S3 – Fitted high-resolution XPS spectra of the Ni 2p in the studied catalysts.

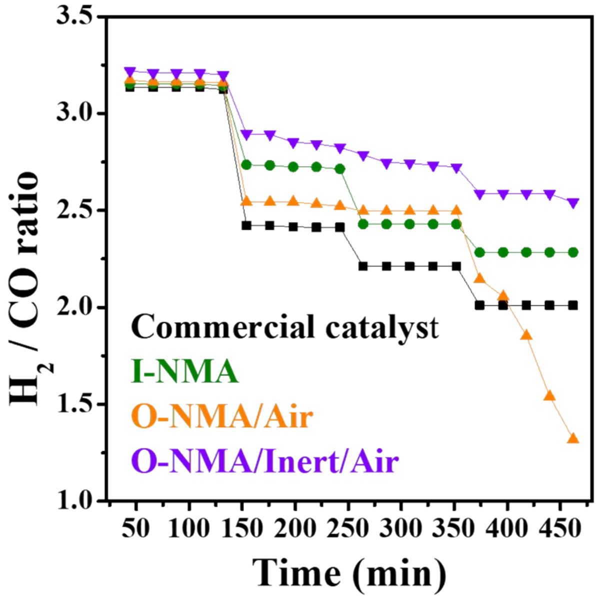

Fig. S4– H_2/CO ratios of mesoporous $Ni/MgAl_2O_4$ catalysts and commercial catalyst at different GHSVs ranging from 10,000 to 40,000 mL g_{cat}^{-1} h^{-1}.

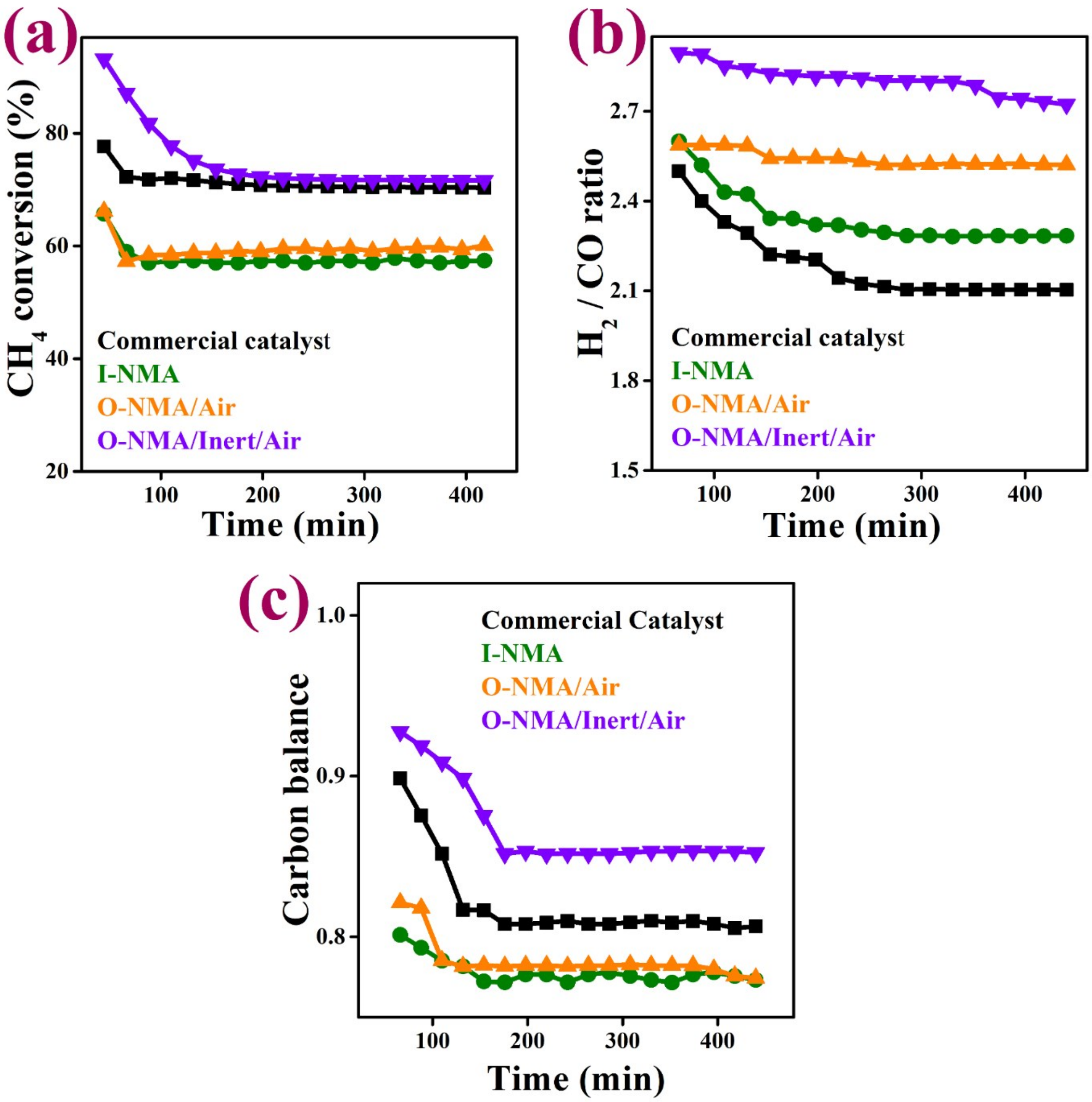

Fig. S5 – CH_4 conversions (a), H_2/CO ratio (b), and carbon balance (c) of mesoporous Ni/$MgAl_2O_4$ catalysts and commercial catalyst at H_2O/CH_4= 1, *T*= 700 °C, *P*= 1.0 atm., and GHSV= 10,000 mL g_{cat}^{-1} h^{-1} for 420 min.

Table S1: BET surface area, pore volume, and pore diameter of the studied catalysts.

Catalyst	Calcined samples			Reduced samples		
	BET Surface Area (m^2/g)	Pore Volume (cm^3/g)	Pore diameter (nm)	BET Surface Area (m^2/g)	Pore Volume (cm^3/g)	Pore diameter (nm)
I-NMA	156.17	0.4185	7.65	98.93	0.2454	17.63
O-NMA/Air	211.18	0.4723	8.01	104.37	0.2735	8.48
O-NMA/Inert/Air	253.08	0.5814	6.58	122.49	0.3433	9.36
O-NMA/Air$_{4h}$	187.49	0.4327	17.08	83.45	0.2517	19.88

Table S2: ICP-OES data of the studied catalysts.

Catalyst	Ni (wt%)	Mg (wt%)	Al (wt%)
I-NMA	18.1	7.7	34.2
O-NMA/Air	18.3	7.8	33.8
O-NMA/Inert/Air	18.2	7.6	34.4
O-NMA/Air_{4h}	18.3	7.8	34.1

Table S3: Binding energies of Ni species in the reduced catalysts.

Catalyst	Binding energy (eV)	
	Ni^0	Ni^{2+}
I-NMA	851.94	855.16
O-NMA/Air	851.58	855.16
O-NMA/Inert/Air	851.53	854.83

Table S4. Comparison of SMR catalytic activity and stability of our catalyst with that of similar composition reported in literature.

Catalyst	Function	Ni wt%	Reaction Temperature (°C)	GHSV h^{-1}	CH_4 conversion	Reference
O-NMA/Inert/Air	SMR	18	800	10,000	**97.62**	**This work**
O-NMA/Inert/Air	SMR	18	800	20,000	**92.05**	**This work**
O-NMA/Inert/Air	SMR	18	800	30,000	**88**	**This work**
$Ni/MgAl_2O_4$	SMR	10	750	9,600	97	1
$NiAl_2O_4$	SMR	31	800	12,000	97	2
$NiAl_2O_4$	SMR	29	700	12,000	91	2
$NiAl_2O_4$	SMR	15	650	38,400	27	3
$NiCaAl_2O_4$	SMR	10	850	32,000	73	4
$NiAl_2O_4$	SMR	10	600	32,000	84	5
$Ni/MgAl_2O_4$	SMR	15.3	600	48,500	48	6
$15Ni/MgAl_2O_4$	SMR	15	600	53,400	51	7
Ni/MgAl	SMR	15	700	3,000	75	8

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