Supplementary Information

Facile Synthesis of Hollow Hierarchical Ni/γ-Al_2O_3 Nanocomposites for Methane Dry Reforming Catalysis

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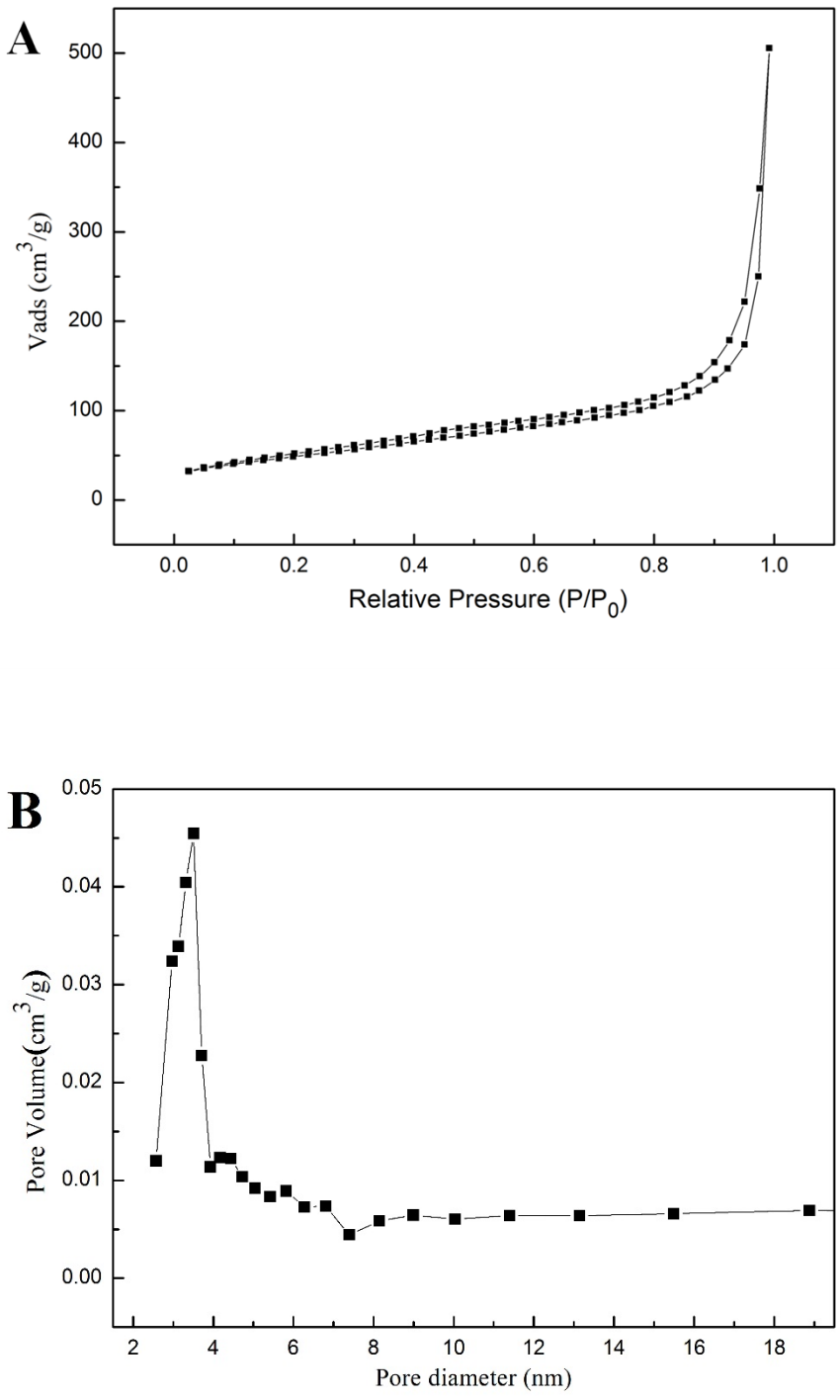

Figure S1. (A) N_2 adsorption and desorption data and (B) corresponding pore size distribution of the hierarchical hollow Ni/Al_2O_3 (NAO, 35 wt%).

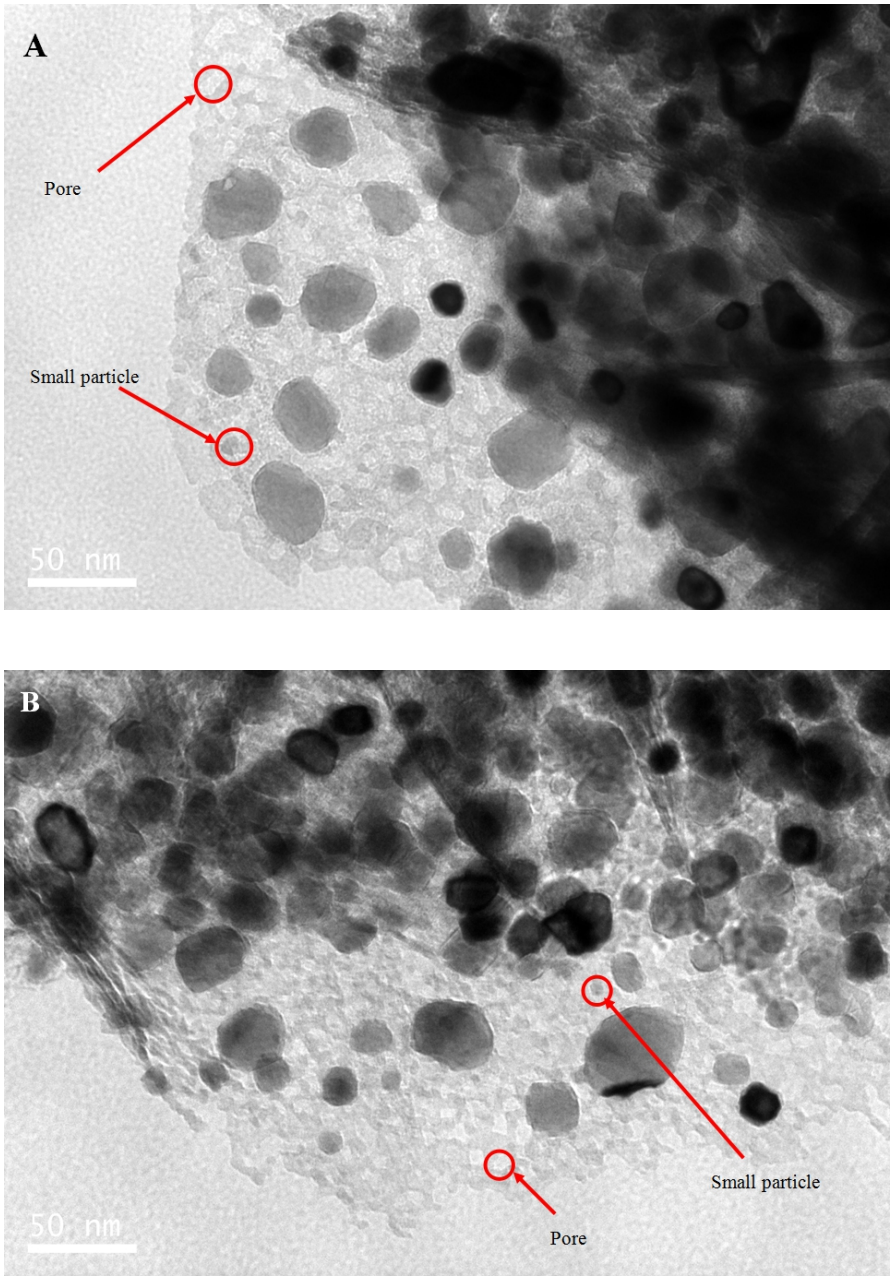

Figure S2. The morphology of hierarchical hollow Ni/Al_2O_3 (NAO, 35 wt%) annealed at (A) 400 °C and (B) 600 °C after H_2 reduction at 700 °C for 2 h.

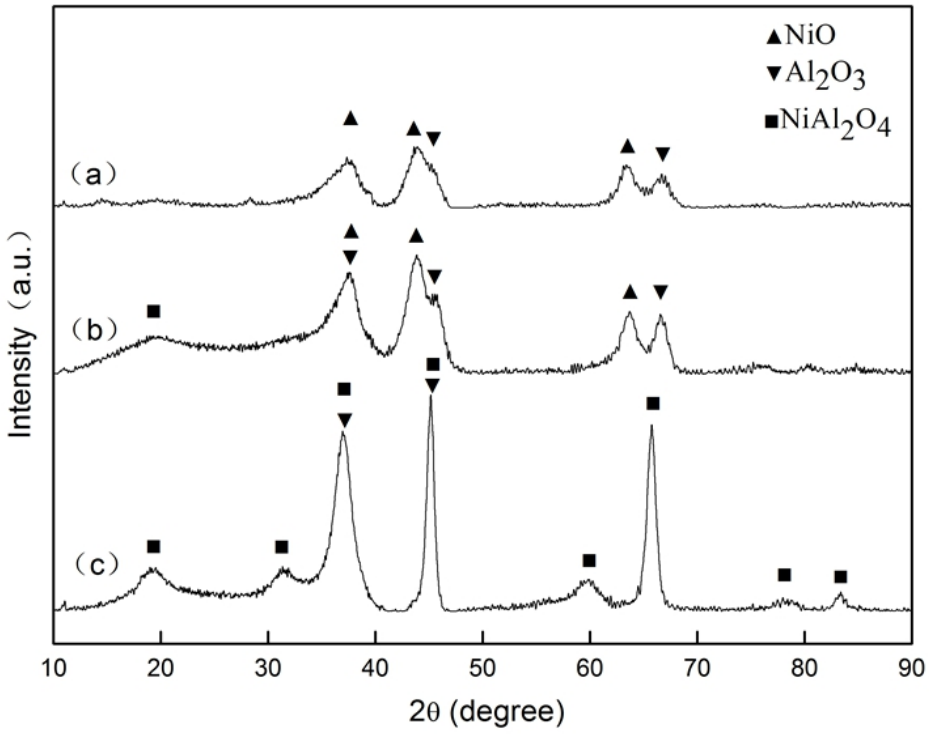

Figure S3. XRD patterns of hierarchical Ni/Al_2O_3 composite calcined at various temperatures (a) 400 °C, (b) 600 °C and (c) 800 °C.

Table S1. The XPS information NOAO samples with various Ni loadings and different calcination temperatures.

Catalyst	Binding Energy（eV）			Ni/Al	Ni loading (%)	Theoretical Ni loading (%)
	Ni $2p_{3/2}$	Al 2p	O 1s			
400 °C	855.1	73.1	531.6	0.219	25.2	35.3
600 °C	855.2	74.3	531.1	0.233	26.9	
800 °C	857.0	73.8	529.8	0.226	26.0	
800 °C	856.8	74.4	531.0	0.250	38.9	47.0
600 °C	856.8	73.9	531.1	0.486	56.0	57.7

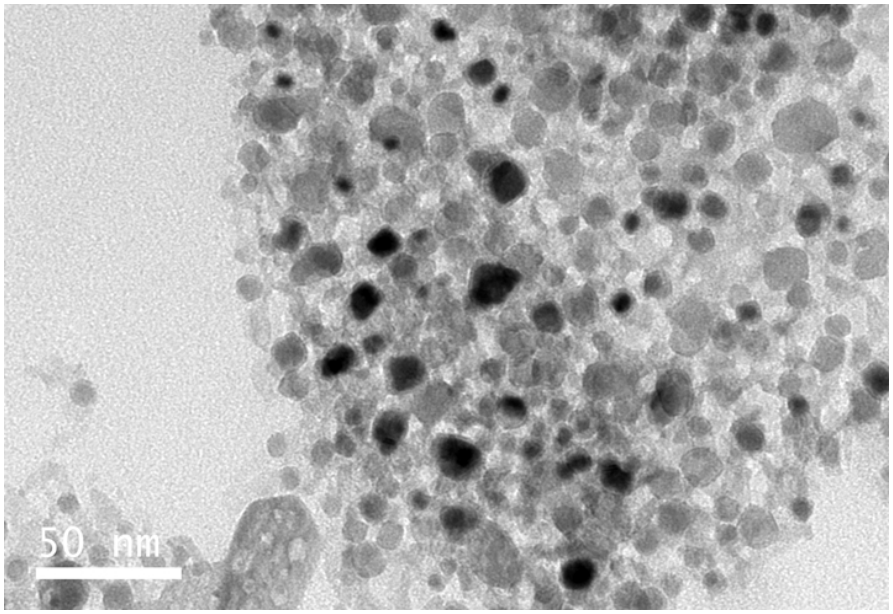

Figure S4. The TEM image of NAO (58 wt%, 800 °C) after long-term test.

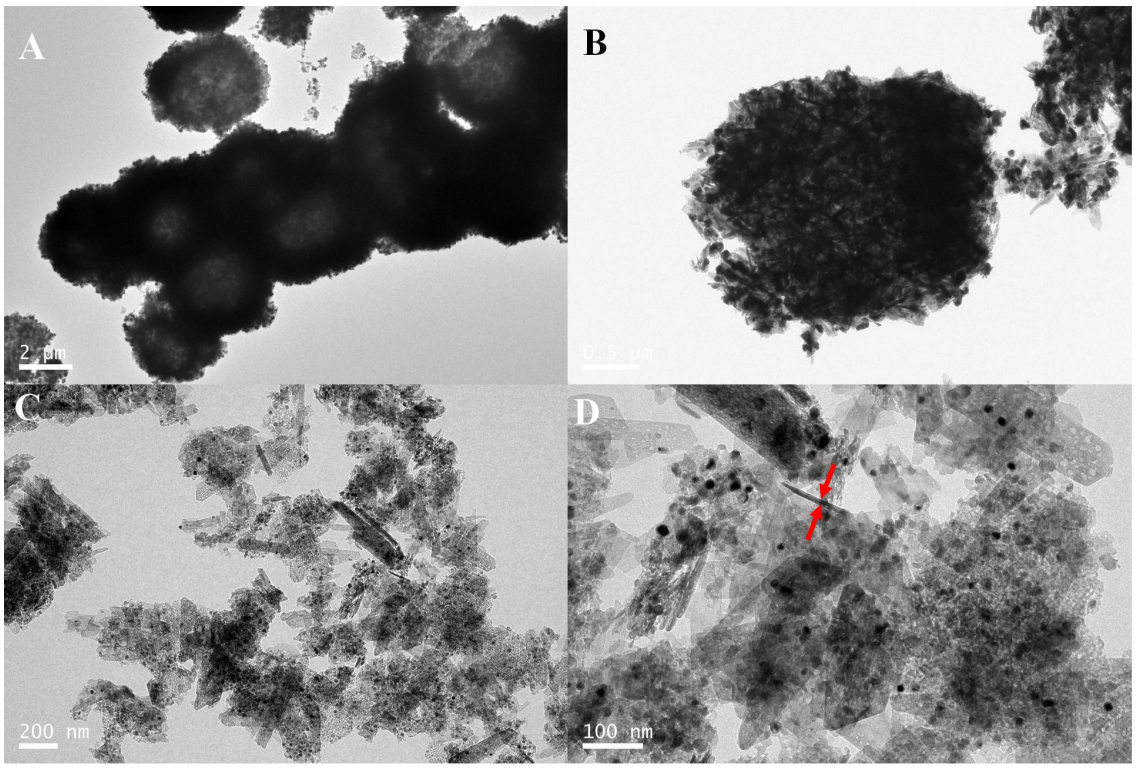

Figure S5. The morphologies of the IM-NAO (A, B) and Ni/Al_2O_3 nanosheet (C, D) after H_2 reduction at 700 °C for 2 h.

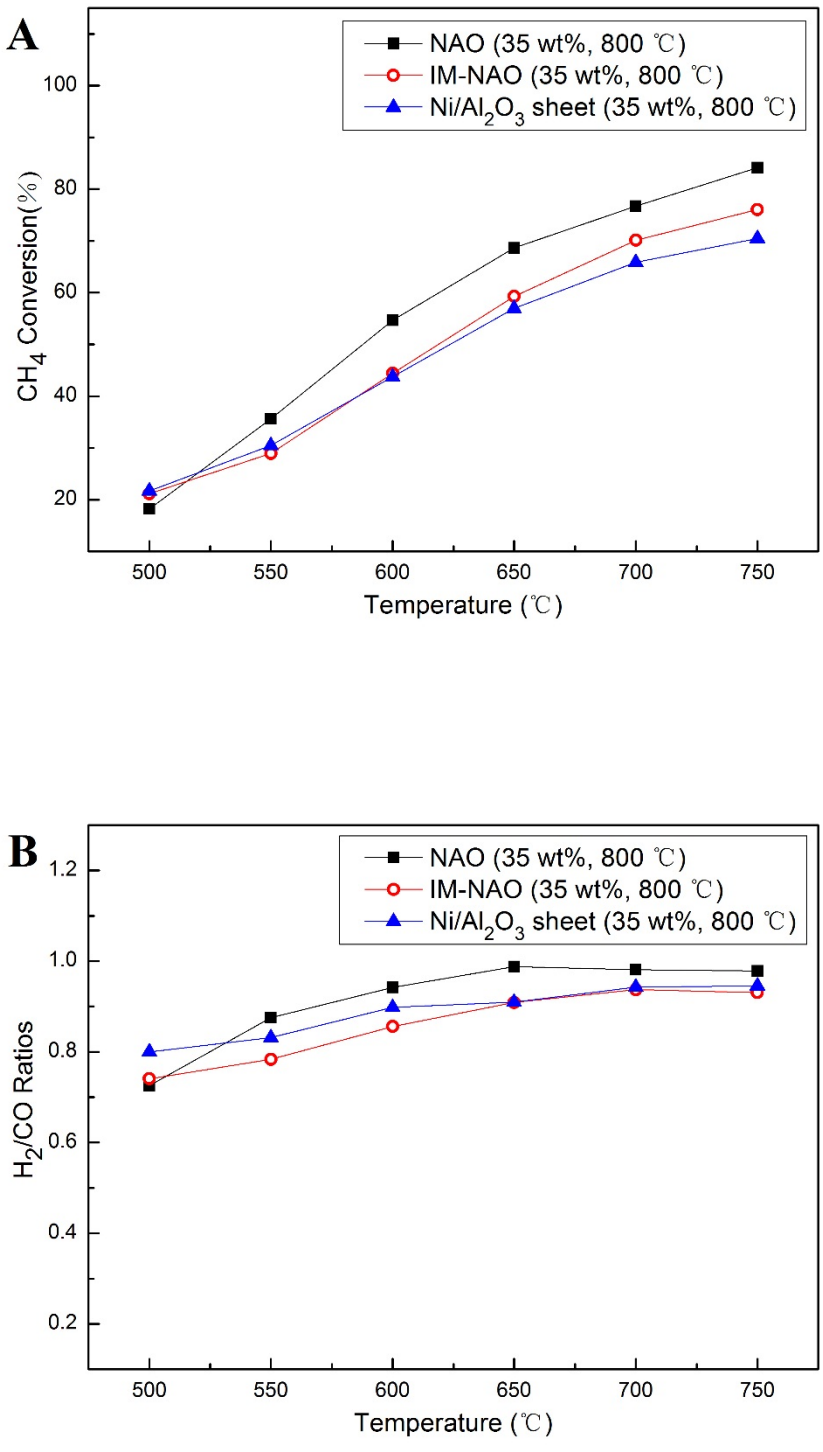

Figure S6. (A) Methane conversion and (B) H_2/CO ratio of the DRM catalysis products for sample NAO (35w%, 800 °C), IM NAO (35w%, 800 °C), and Ni/Al_2O_3 sheet (35w%, 800 °C).

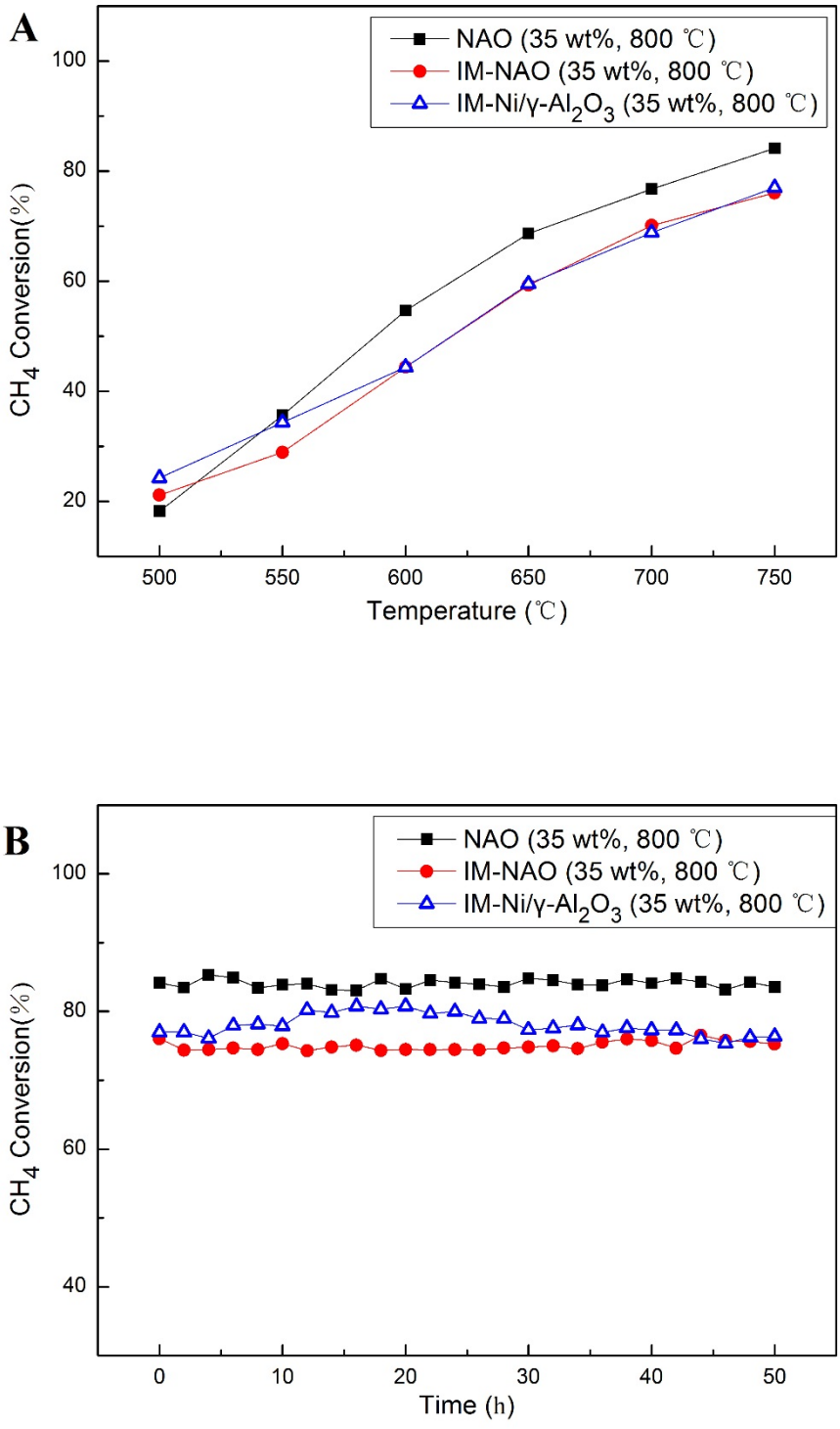

Figure S7. (A) Methane conversion of DRM catalysis at different temperatures, (B) Methane conversion of DRM catalysis in a long term test (50 h) at 750 °C for sample NAO (35w%), IM NAO (35w%), and IM-Ni/γ-Al_2O_3 (35w%).

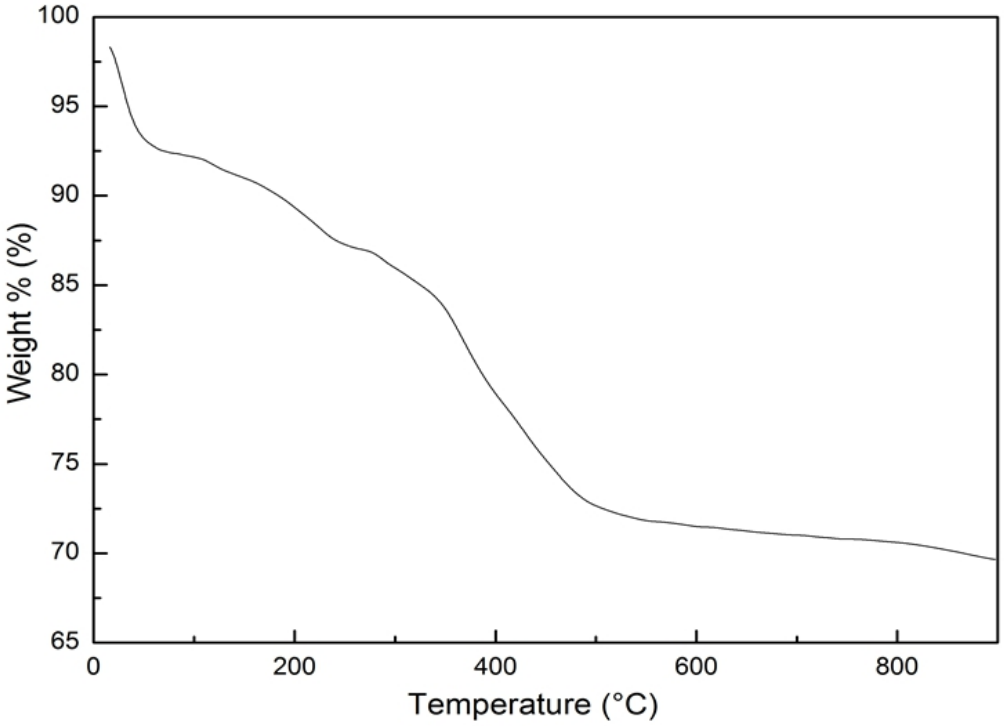

Figure S8. The TG analysis of NiAl-LDH precursor.

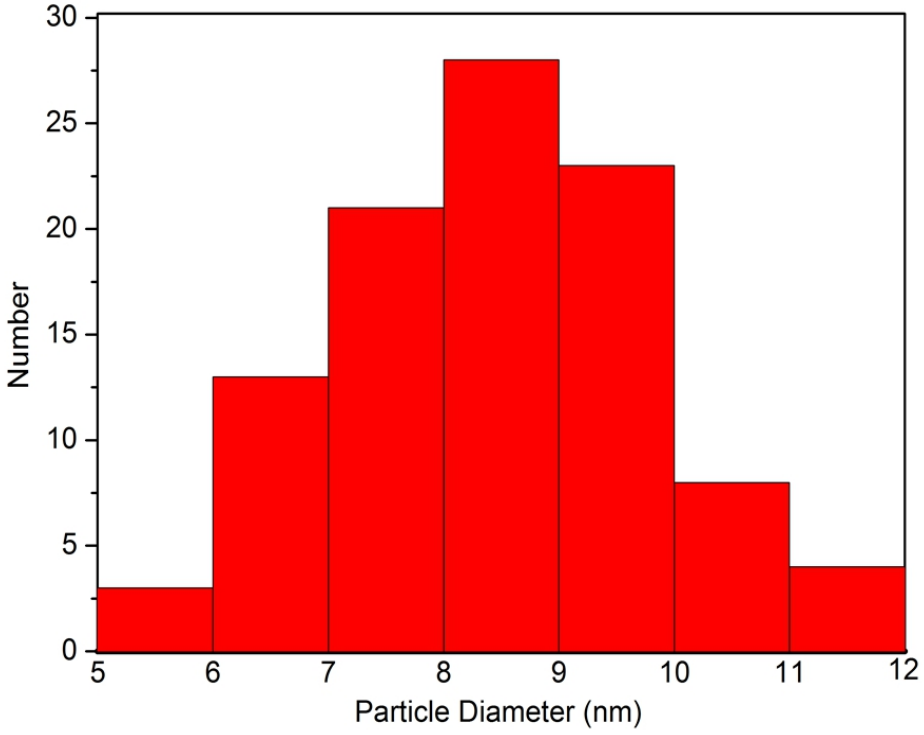

Figure S9. The particle distribution of NAO (35 wt%, 800 °C) after long-term test.

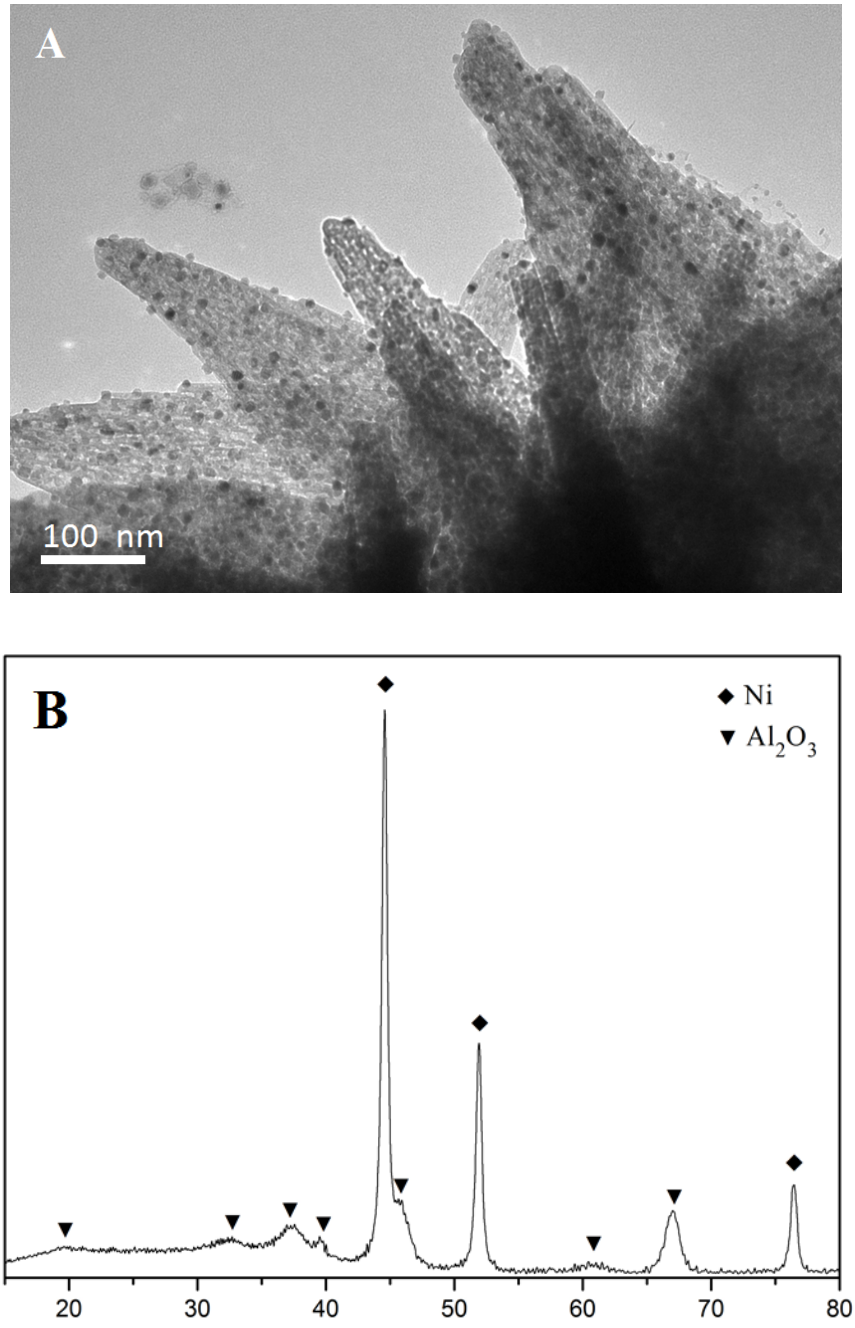

Figure S10. The TEM image and XRD pattern of NAO (35 wt%, 800 °C) after long-term test.