ARTICLE

Electronic Supplementary Information

Chemical Route to Prepare Nickel Supported on Intermetallic $Ti_6Si_7Ni_{16}$ Nanoparticles Catalyzing CO Methanation

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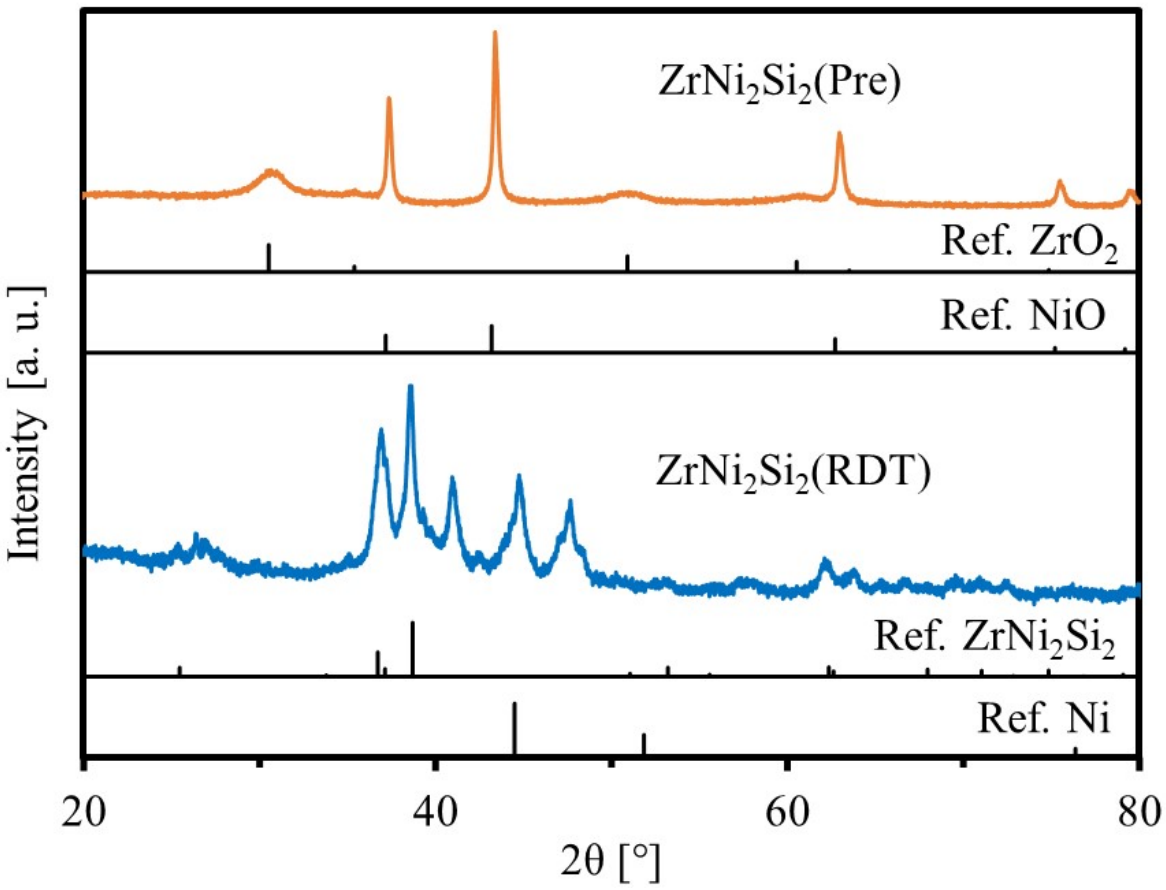

Fig. S1. XRD patterns of $ZrNi_2Si_2$(Pre) and $ZrNi_2Si_2$(RDT).

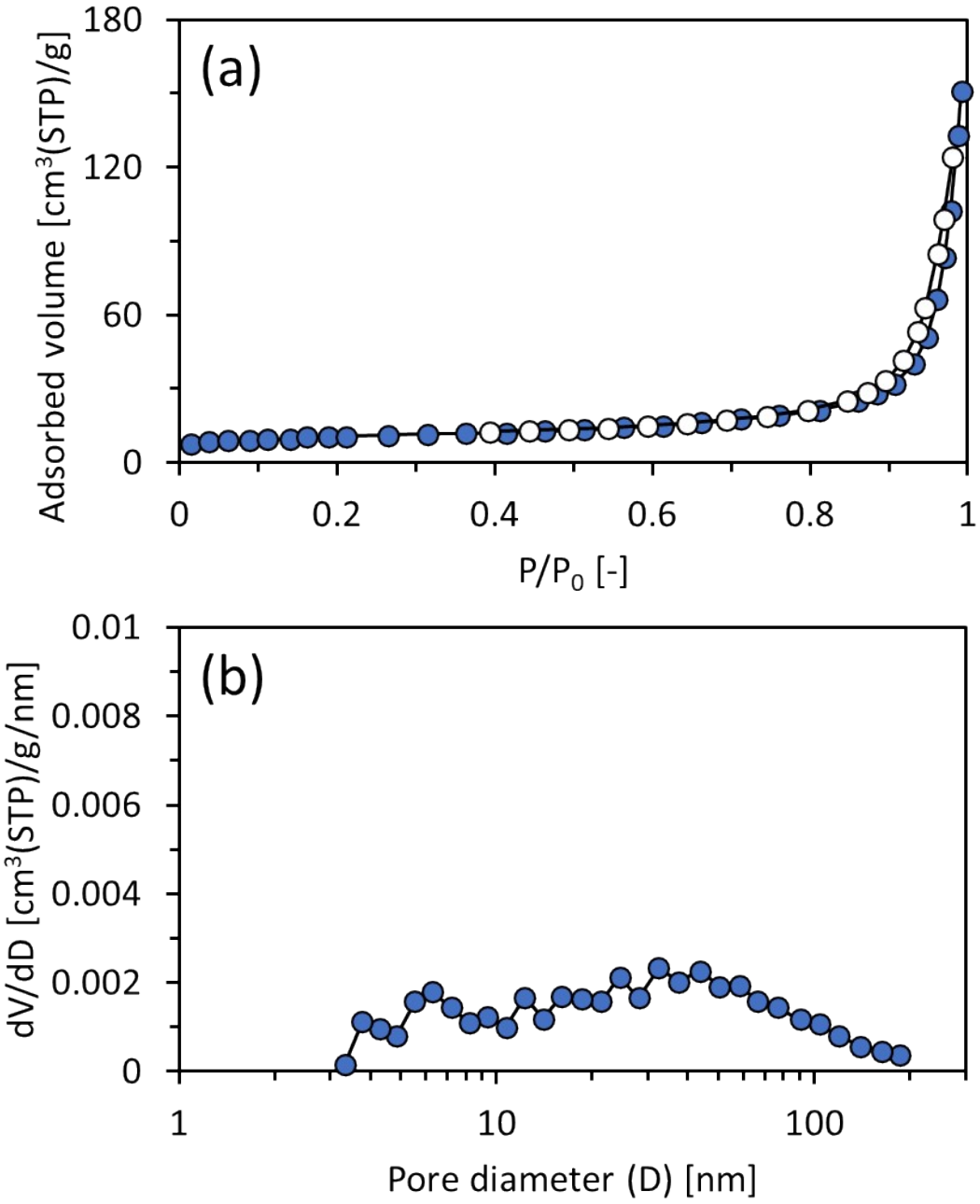

Fig. S2. (a) Adsorption and desorption isotherms of nitrogen and (b) pore size distribution of $Ti_6Si_7Ni_{16}$(RDT).

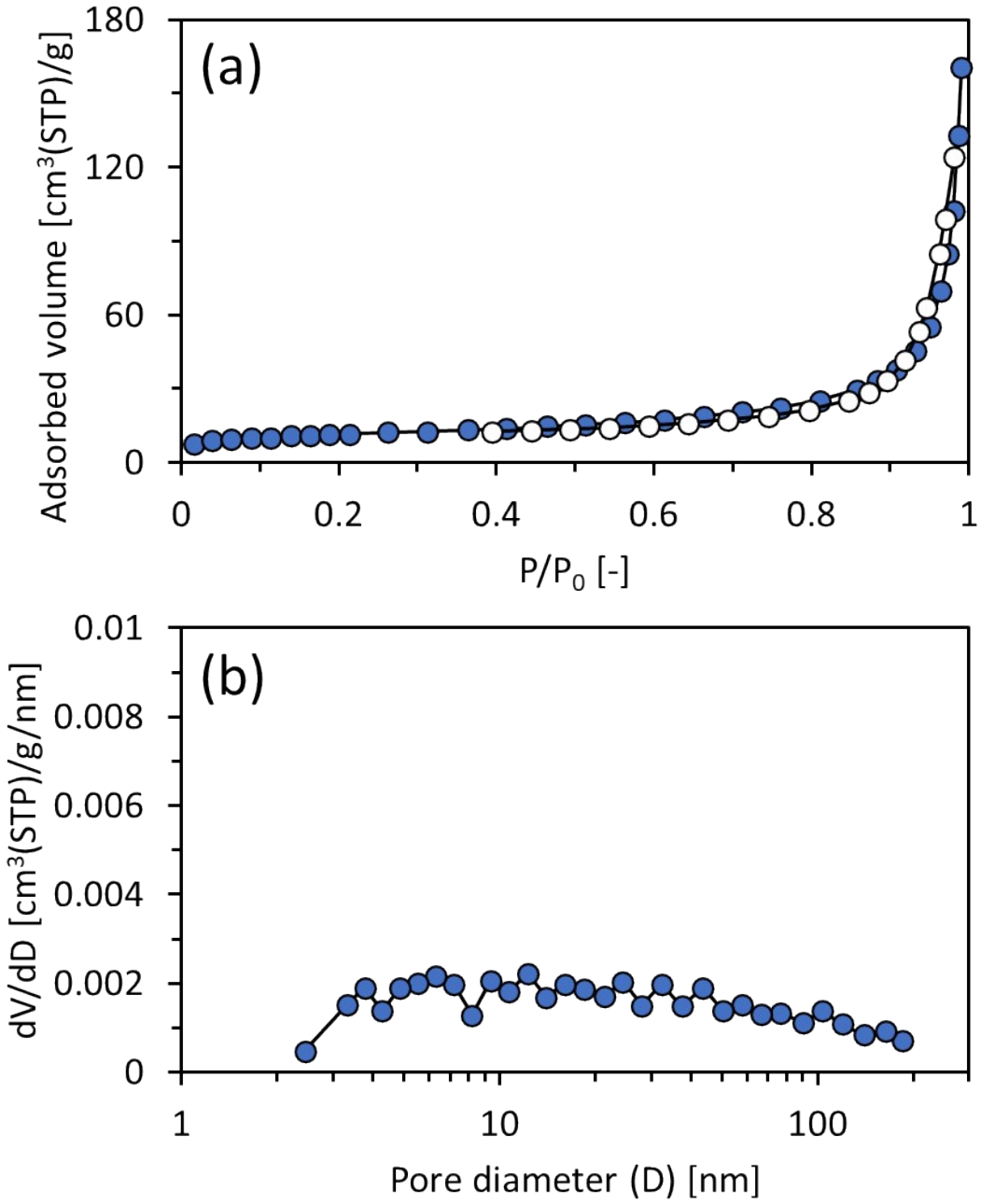

Fig. S3. (a) Adsorption and desorption isotherms of nitrogen and (b) pore size distribution of $ZrNi_2Si_2$ (RDT).

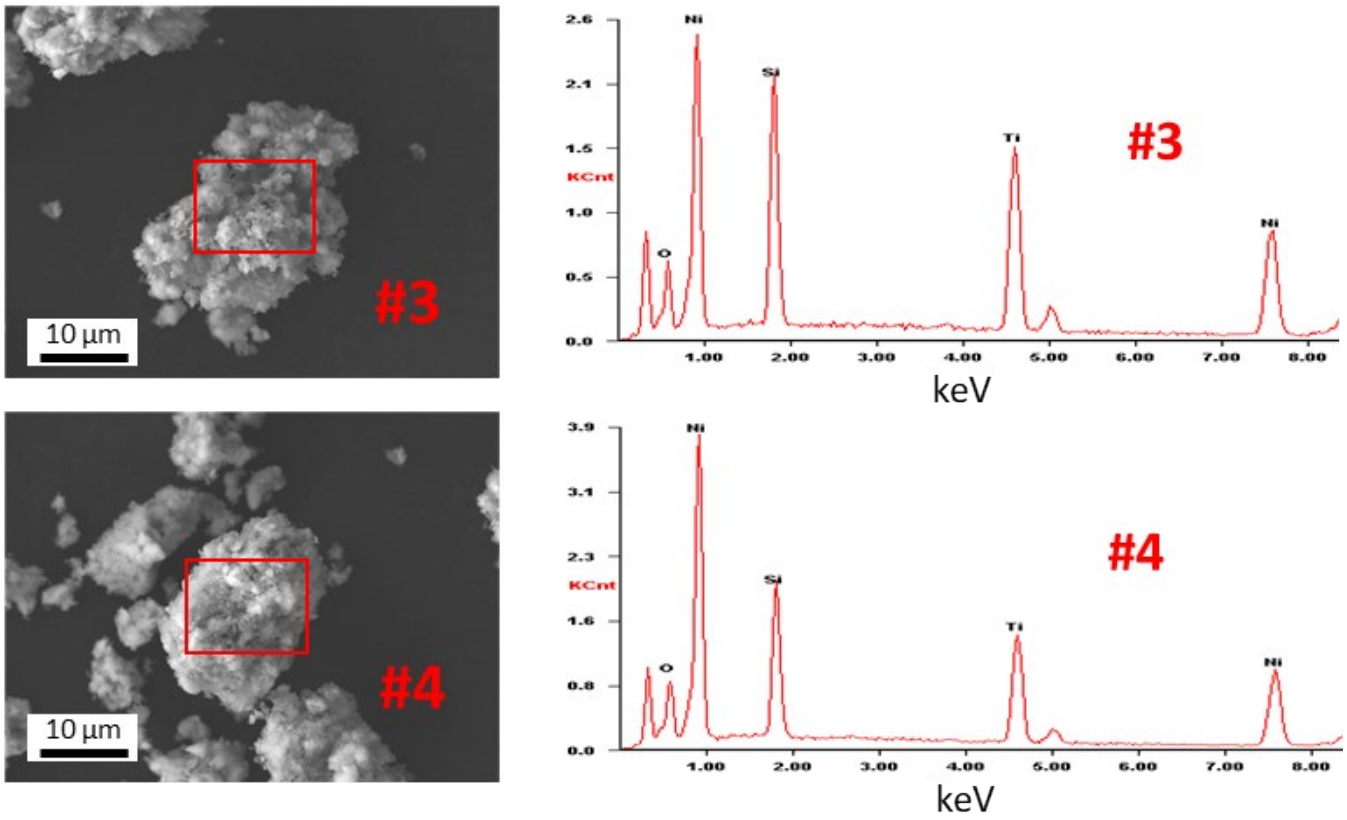

Fig. S4. SEM images for $Ti_6Si_7Ni_{16}$(RDT) with the corresponding EDS spectra at #3 and #4.

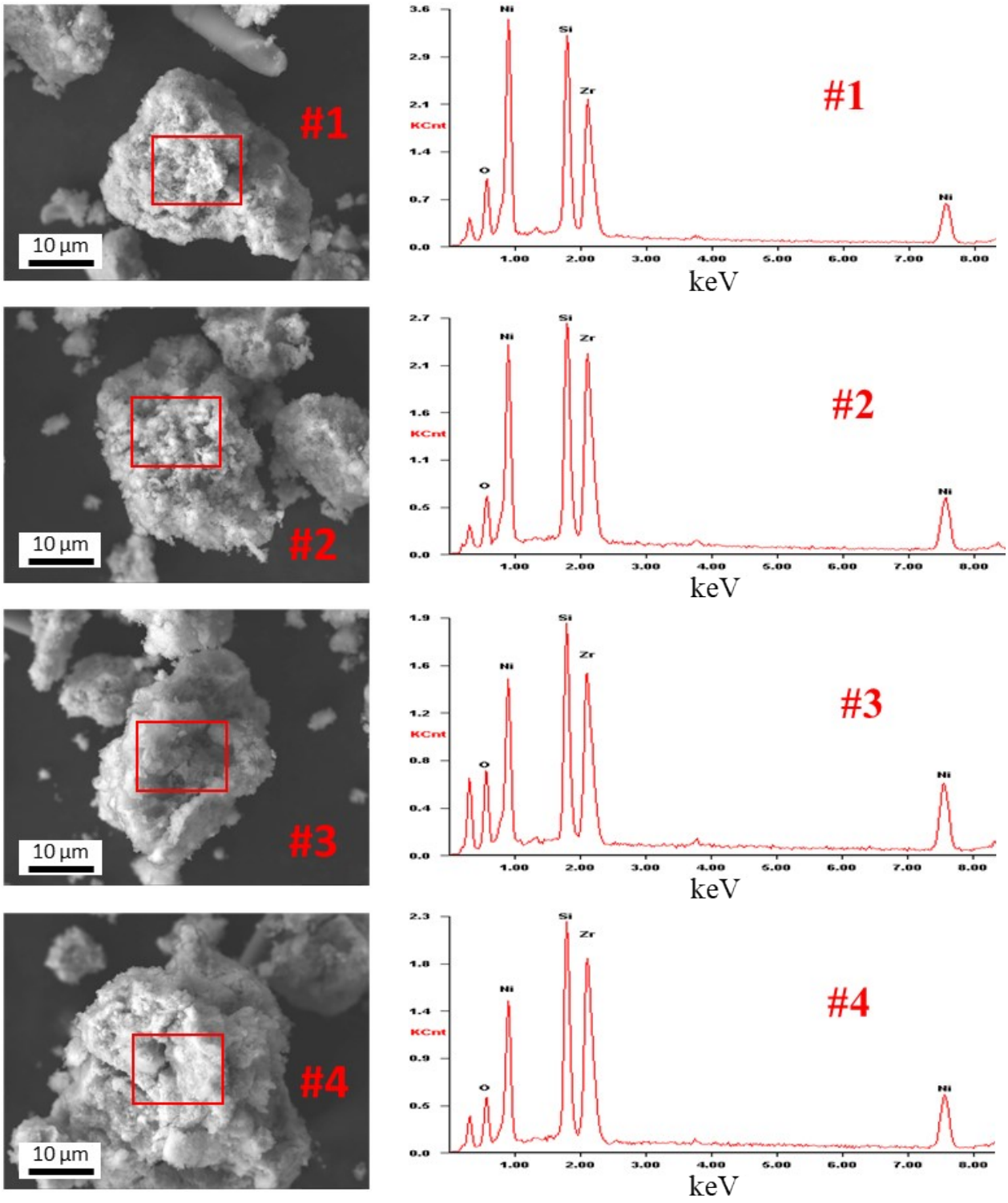

Fig. S5. SEM images for $ZrNi_2Si_2$(RDT) with the corresponding EDS spectra at #1, #2, #3, and #4.

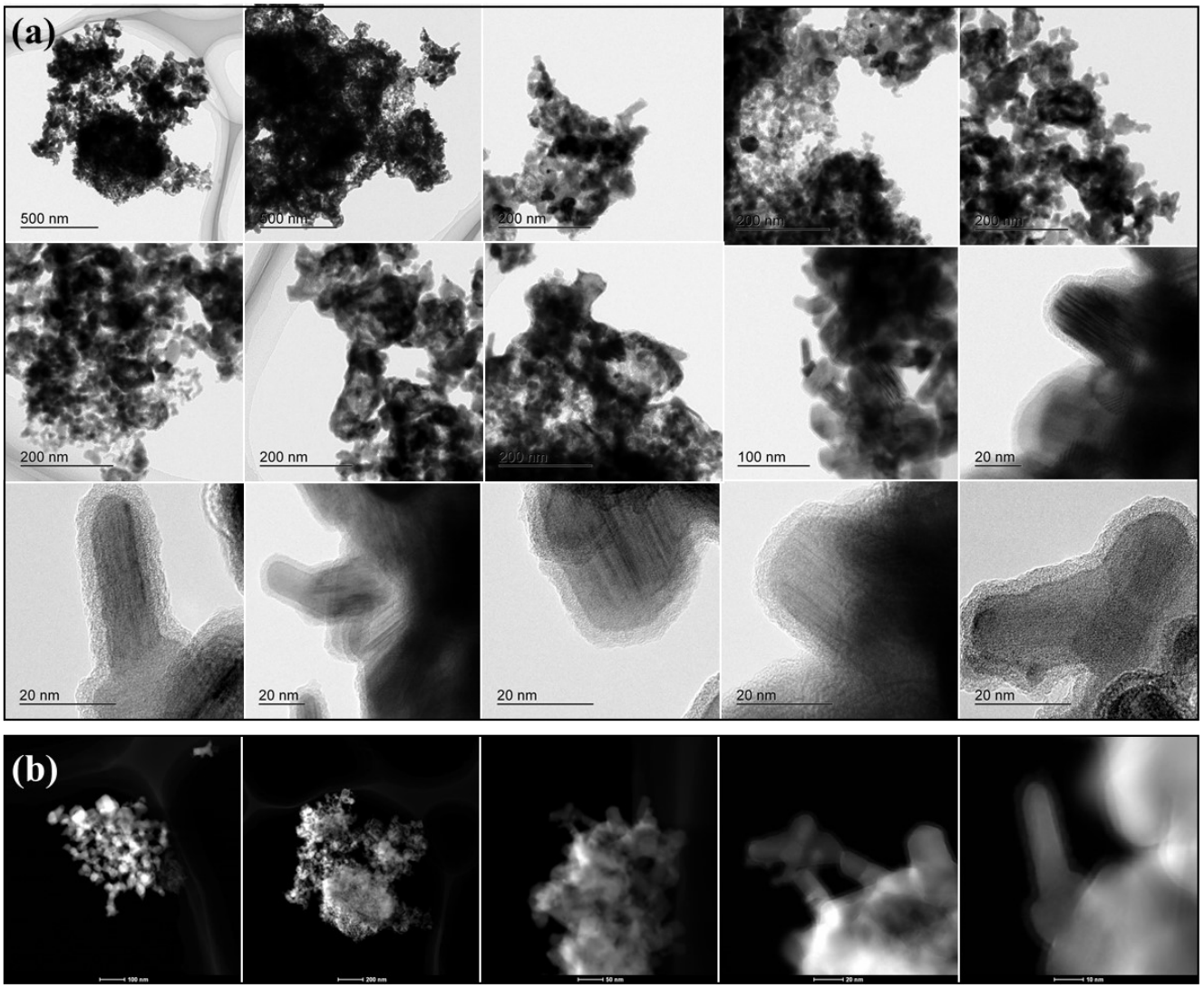

Fig. S6. (a) TEM and (b) HAADF-STEM images for $Ti_6Si_7Ni_{16}$(RDT).

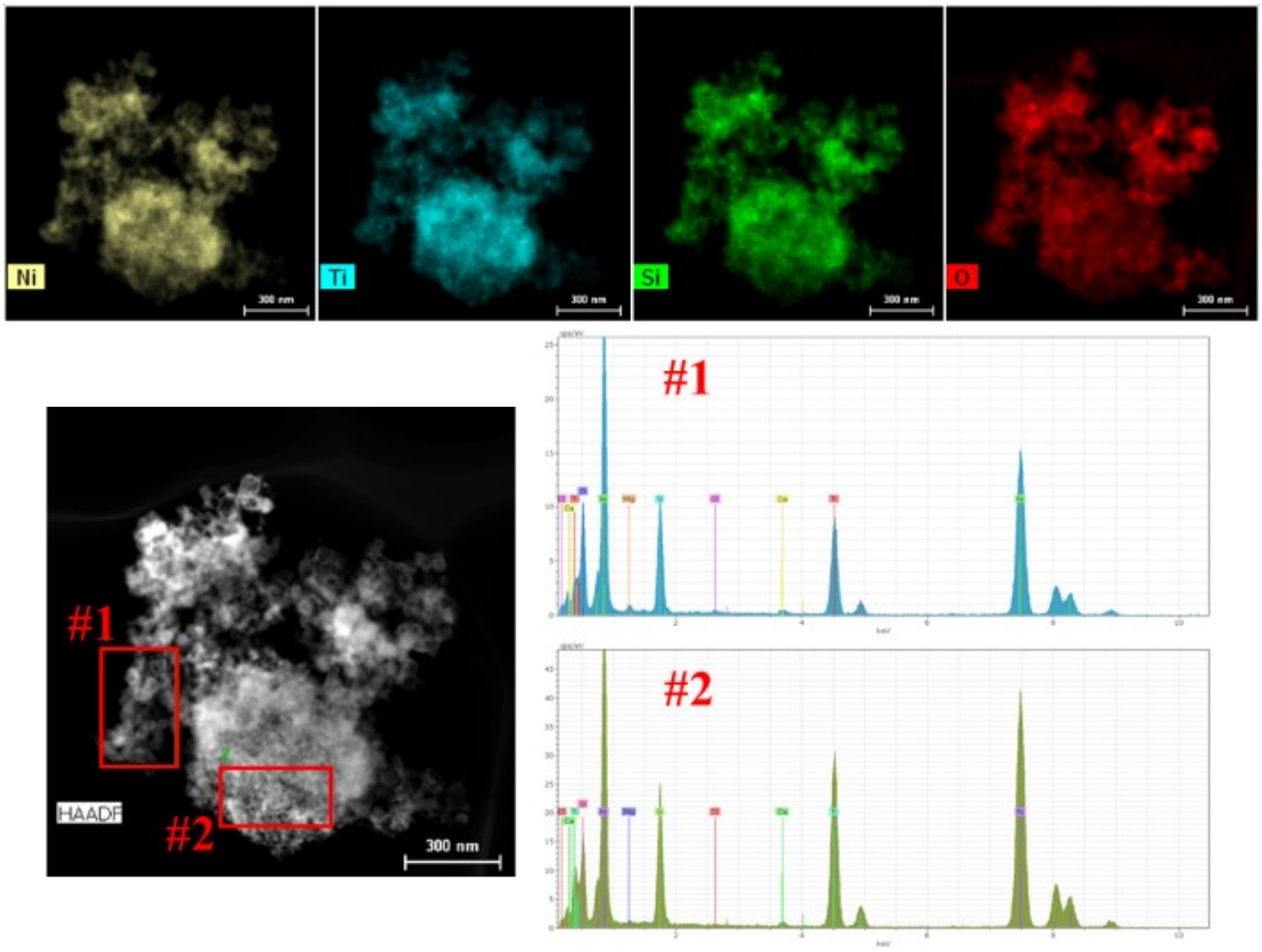

Fig. S7. TEM-EDX analysis of $Ti_6Si_7Ni_{16}$(RDT) and the elemental analysis at positions #1 and #2.

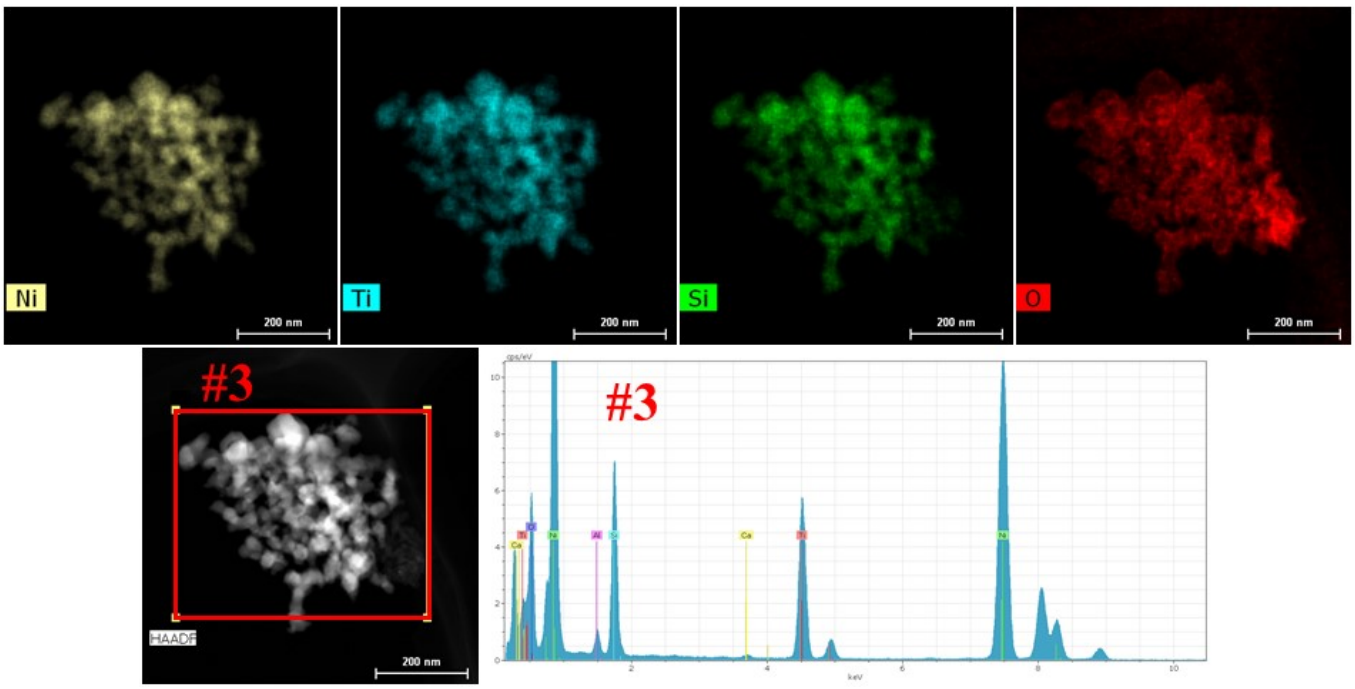

Fig. S8. TEM-EDX analysis of $Ti_6Si_7Ni_{16}$(RDT) and elemental analysis at position #3.

Table S1. Constituent element ratio at #1, #2, #3, and #4 in the prepared $Ti_6Si_7Ni_{16}$(RDT) measured by TEM-EDX.

Position	Ni	Si	Ti	O	Ca	Cl	Mg	Al
#1	36.2	18.9	15.8	26.8	0.7	0.5	1.0	-
#2	41.4	17.6	23.3	16.6	0.6	0.1	0.4	-
#3	39.7	18.4	15.8	23.5	0.3	-	-	2.3
#4	30.6	21.5	18.6	28.3	0.5	-	0.5	-

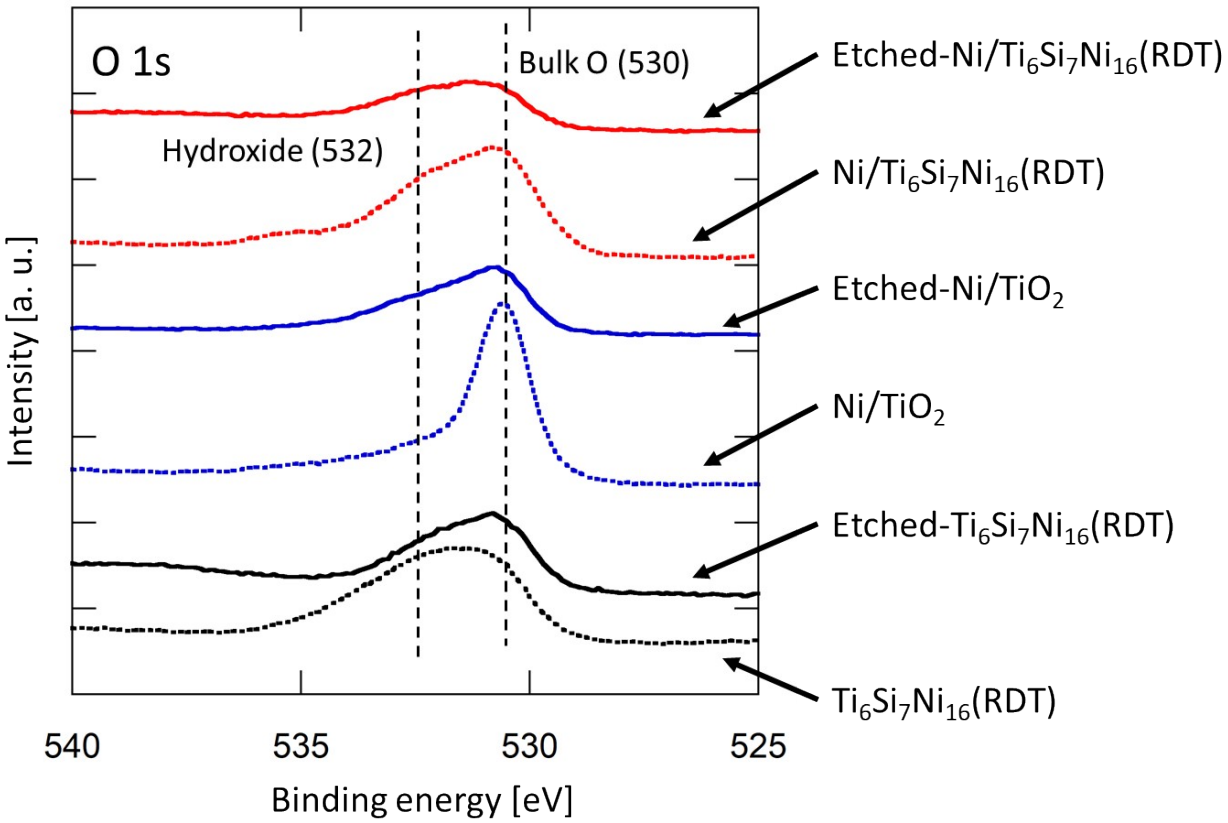

Fig. S9. XPS spectra of O 1s for the etched-Ni/$Ti_6Si_7Ni_{16}$(RDT), Ni/$Ti_6Si_7Ni_{16}$(RDT), etched-Ni/TiO_2, Ni/TiO_2, etched-$Ti_6Si_7Ni_{16}$(RDT), and $Ti_6Si_7Ni_{16}$(RDT).

Table S2. Nickel loading amounts measured by EDS analyses for $Ni/Ti_6Si_7Ni_{16}$(RDT) and Ni/TiO_2.

Catalyst	Entry No.	Molar ratio [mol%]			Ni loading amount [wt%]
		Ti	Ni	Si	
$Ni/Ti_6Si_7Ni_{16}$(RDT)	1	20.99	64.47	14.55	9.2
	2	20.99	64.59	14.43	
	3	20.96	64.42	14.62	
	Average	20.98	64.49	14.53	
Ni/TiO_2	1	90.62	9.38	-	7.1
	2	90.64	9.36	-	
	3	90.62	9.38	-	
	Average	90.63	9.37	-	

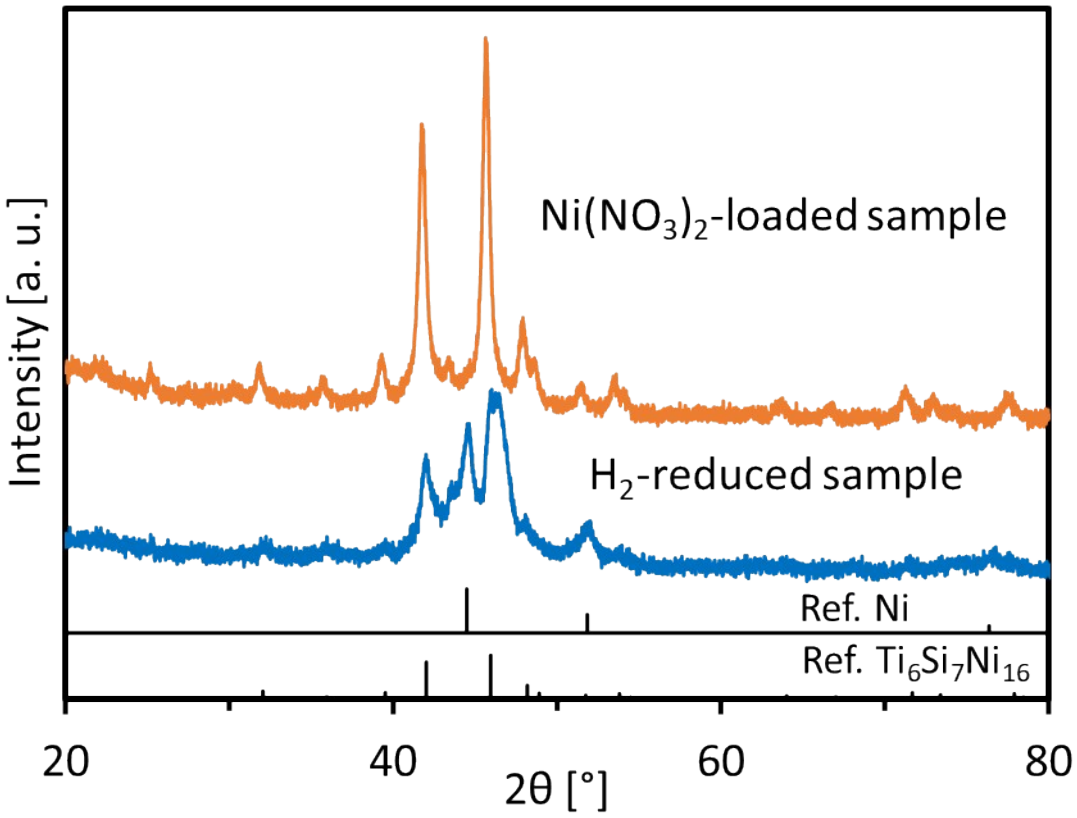

Fig. S10. XRD patterns of $Ni(NO_3)_2/Ti_6Si_7Ni_{16}$(RDT) (Orange) and $Ni/Ti_6Si_7Ni_{16}$(RDT) (Blue), reduced at 500°C in H_2/N_2.

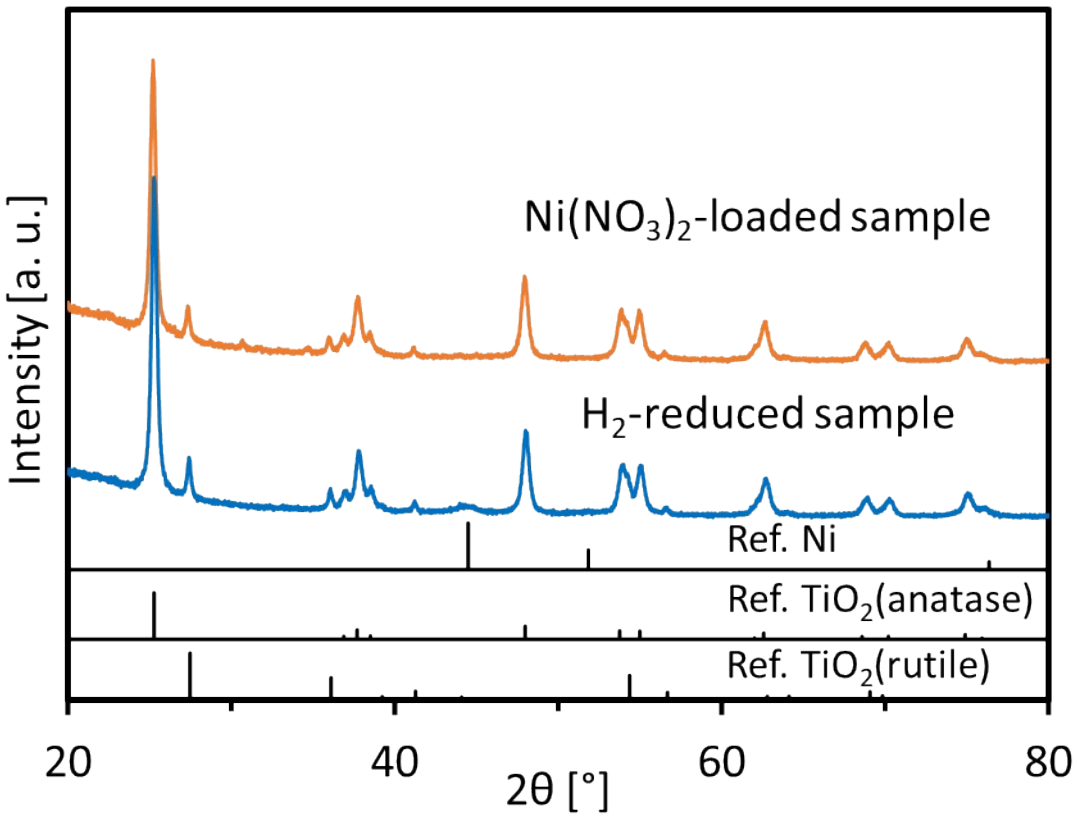

Fig. S11. XRD patterns of $Ni(NO_3)_2/TiO_2$ (Orange) and Ni/TiO_2 (blue), reduced at 500°C in H_2/N_2.