Electronic Supplementary Information

Efficient Conversion of CO_2 to Methane Using Thin-Layer SiO_x Matrix Anchored Nickel Catalysts

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Table S1 Structure parameters of the optimized $Ni_3Si_2O_5(OH)_4$ basic cell.

Symmetry	Space-group: P_{31m} (157) - trigonal	
Cell parameters	a = 5.3621 Å	α = 90°
	b = 5.3621 Å	β = 90°
	c = 7.3784 Å	γ = 120°

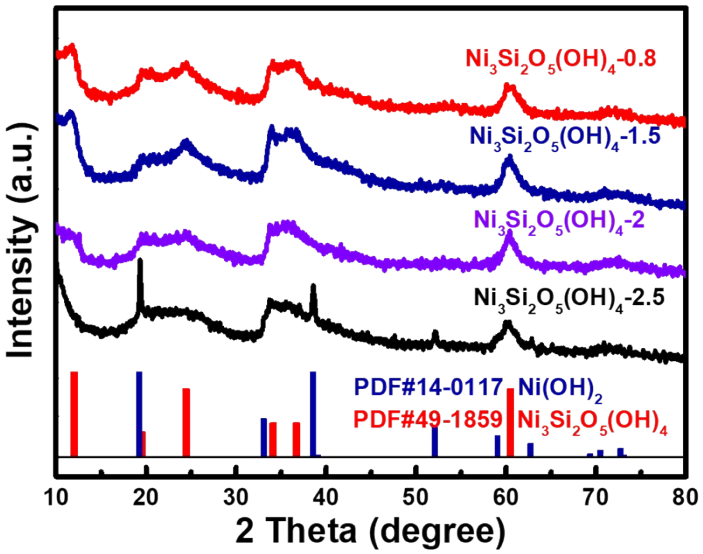

Fig. S1 XRD patterns of $Ni_3Si_2O_5(OH)_4$ precursors with different Ni/Si ratios. Note that the coexistence of $Ni(OH)_2$ and $Ni_3Si_2O_5(OH)_4$ phases suggests that when the amount of nickel is too much, the suppression effect of $Ni(OH)_2$ formation by NH_4Cl becomes weak.[S1]

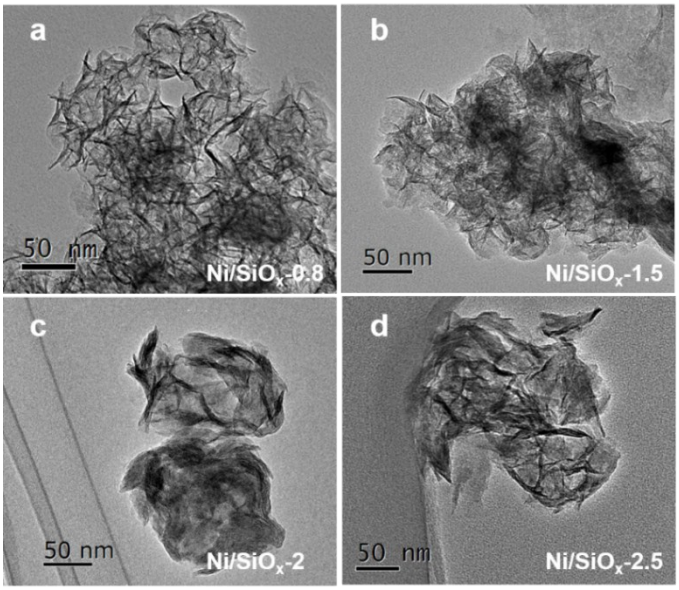

Fig. S2 TEM images of layered structure $Ni_3Si_2O_5(OH)_4$ precursors with different Ni/Si ratios: (a) Ni/SiO_x-0.8, (b) Ni/SiO_x-1.5, (c) Ni/SiO_x-2, and (d) Ni/SiO_x-2.5.

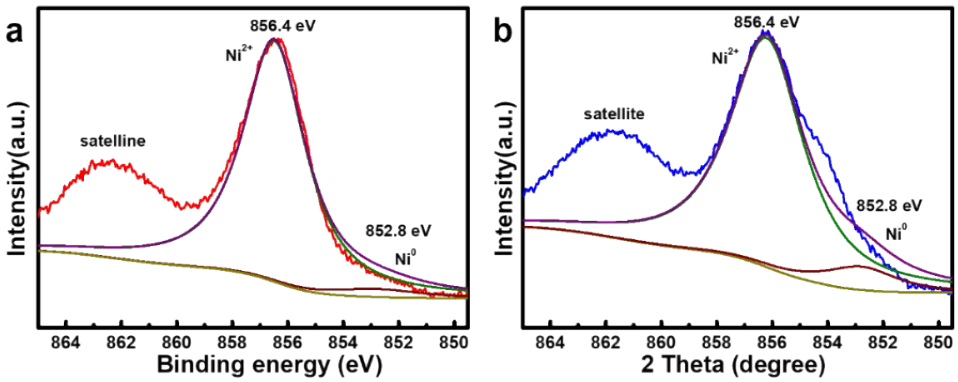

Fig. S3 XPS Ni $2p_{3/2}$ spectra of (a) Ni/SiO_x-1.5 and (b) Ni/SiO_x-2 catalysts.

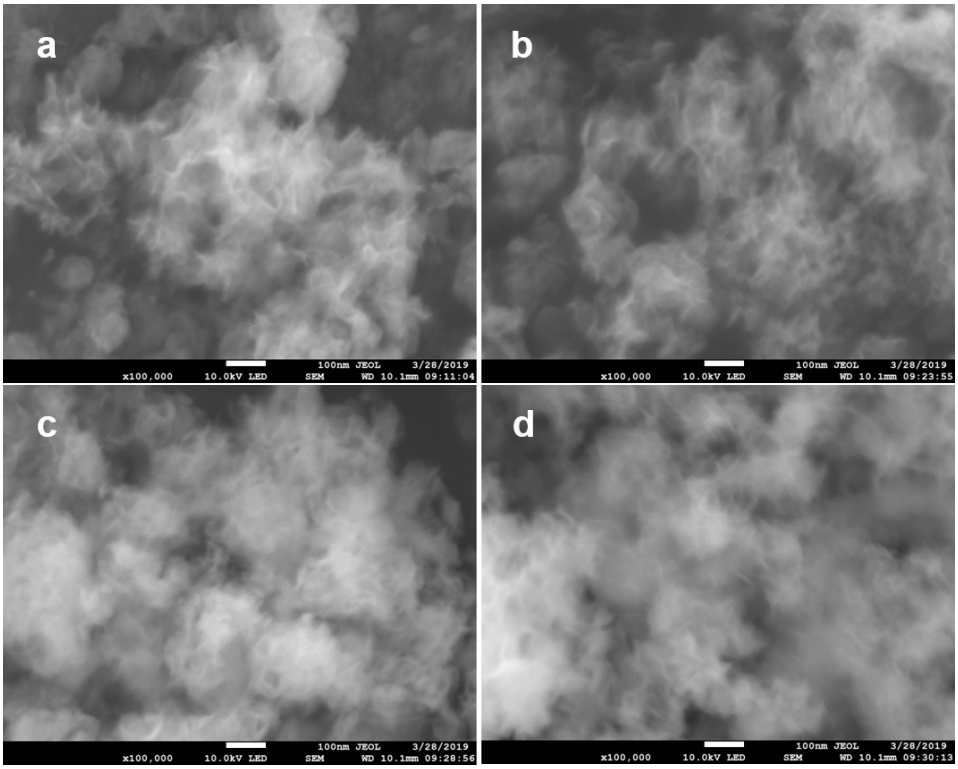

Fig. S4 SEM images of (a) Ni/SiO_x-0.8, (b) Ni/SiO_x-1.5, (c) Ni/SiO_x-2, and (d) Ni/SiO_x-2.5 catalysts.

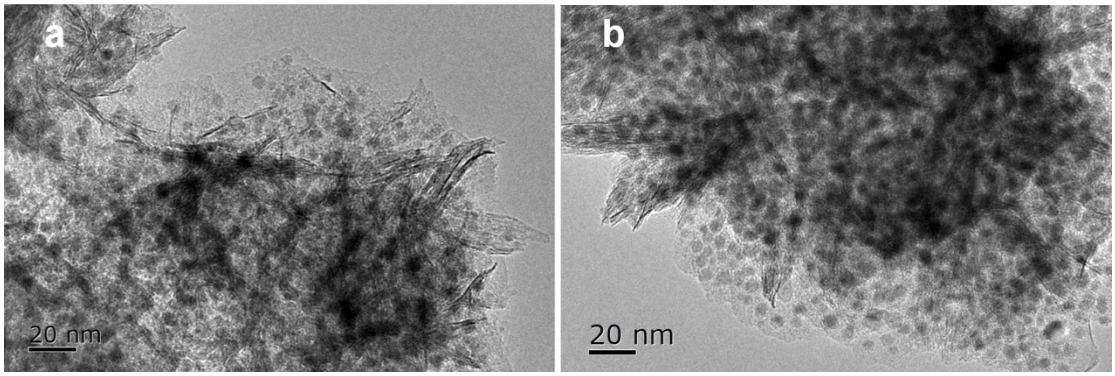

Fig. S5 HRTEM images of the used Ni/SiO_x-2 catalyst.

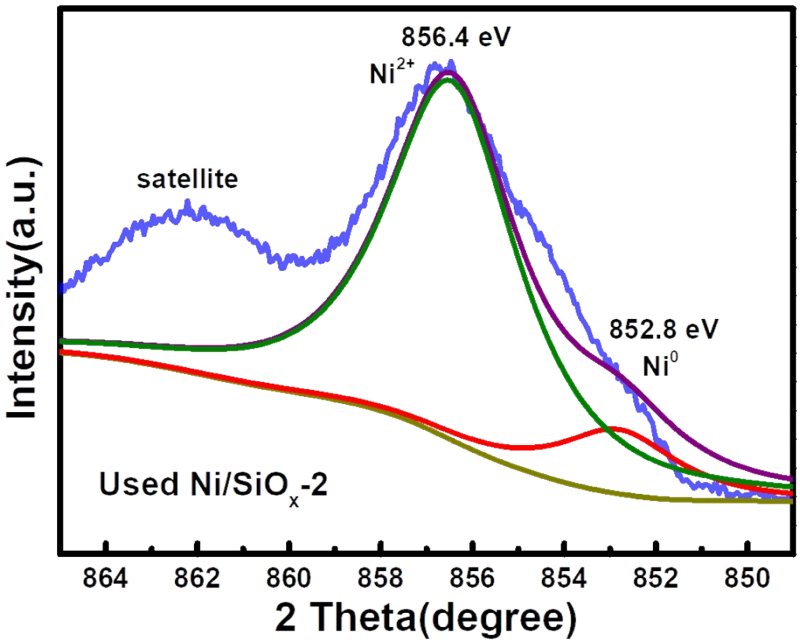

Fig. S6 XPS Ni $2p_{3/2}$ spectrum of used Ni/SiO_x-2 catalyst.

Reference

(S1) C. J. Tang, J. Z. Sheng, C. Xu, S. M. B. Khajehbashi, X. P. Wang, P. Hu, X. J. Wei, Q. L. Wei, L. Zhou and L. Q. Mai, *J. Mater. Chem. A*, 2015, **3**, 19427–19432.