Silicon-nickel intermetallic compounds supported on silica as a highly efficient catalyst for CO methanation

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Supplementary Information

Figure S1 shows the XRD patterns indicating that the Ni$_3$Si$_2$O$_5$(OH)$_4$ phase is very stable on the thermal calcinations in air at 400 °C and the reduction in hydrogen at 350 °C. Only a part of Ni$_3$Si$_2$O$_5$(OH)$_4$ was reduced to metallic Ni phase. However, the peaks due to Ni$_3$Si$_2$O$_5$(OH)$_4$ at 35° and 62° vanished with the increasing silicification temperature. Therefore, it can be concluded that the stable Ni$_3$Si$_2$O$_5$(OH)$_4$ phase can be reacted with SiH$_4$ as the follow reaction: Ni$_3$Si$_2$O$_5$(OH)$_4$ + SiH$_4$ → NiSi$_x$ + SiO$_2$ + H$_2$O.

Fig. S1 XRD patterns of Ni$_3$Si$_2$O$_5$(OH)$_4$/SiO$_2$ precursor, calcined sample, and reduced sample.