Supplementary information for

An in-situ approach to preparing Ni_2P/SiO_2 catalyst under mild condition and its performance for the deoxygenation of methyl laurate as a model compound to hydrocarbons

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Preparation of Ni_3P/SiO_2-TPR, $Ni_{12}P_5/SiO_2$-TPR and Ni_2P/SiO_2-TPR

Silica was incipiently impregnated with a mixture aqueous solution of $NH_4H_2PO_4$ and $Ni(NO_3)_2$, followed by drying at 120 ^oC for 12 h and calcination at 550 ^oC for 4 h to produce the catalyst precursor, where the nominal Ni/P ratio was 3.0, 2.0 or 1.0. Secondly, the catalyst was prepared by the TPR process from the precursor as the following program: heating from room temperature to 250 ^oC at 10 ^oC /min and from 523 to 923 ^oC at 1 ^oC /min, maintaining at 923 ^oC for 3 h and then cooling to room temperature. The H_2 (>99.9%) flow was set as 320 ml/min per gram of precursor. Ni_3P/SiO_2-TPR, $Ni_{12}P_5/SiO_2$-TPR and Ni_2P/SiO_2-TPR were prepared from the precursors with the Ni/P ratios of 3.0, 2.0 and 1.0, respectively. To avoid the drastic oxidation, the prepared catalysts were passivated in a 0.5%(vol)O_2/N_2 flow for 4 h before exposure to air.

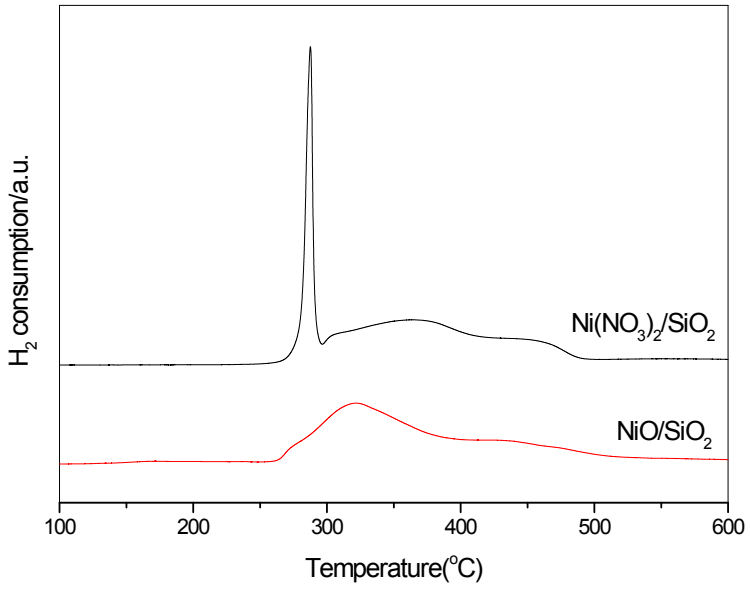

Figure 1S H_2-TPR profiles of NiO/SiO_2 or $Ni(NO_3)_2/SiO_2$

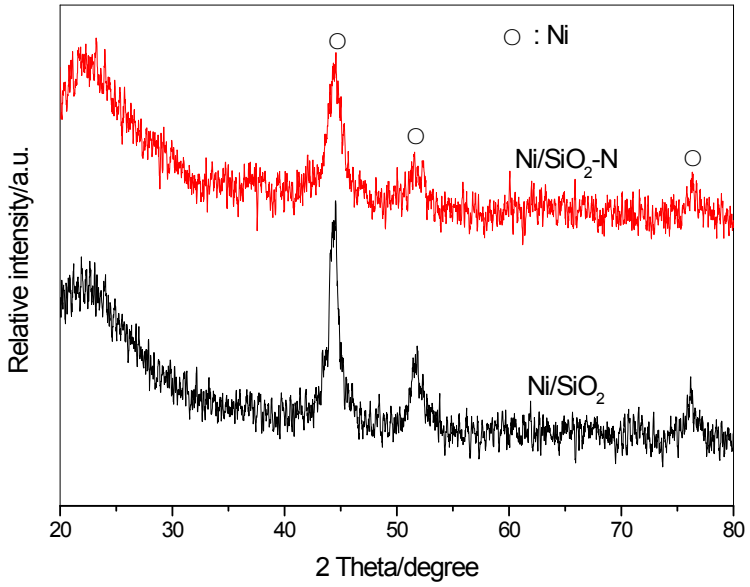

Figure 2S XRD patterns of Ni/SiO_2 and Ni/SiO_2-N

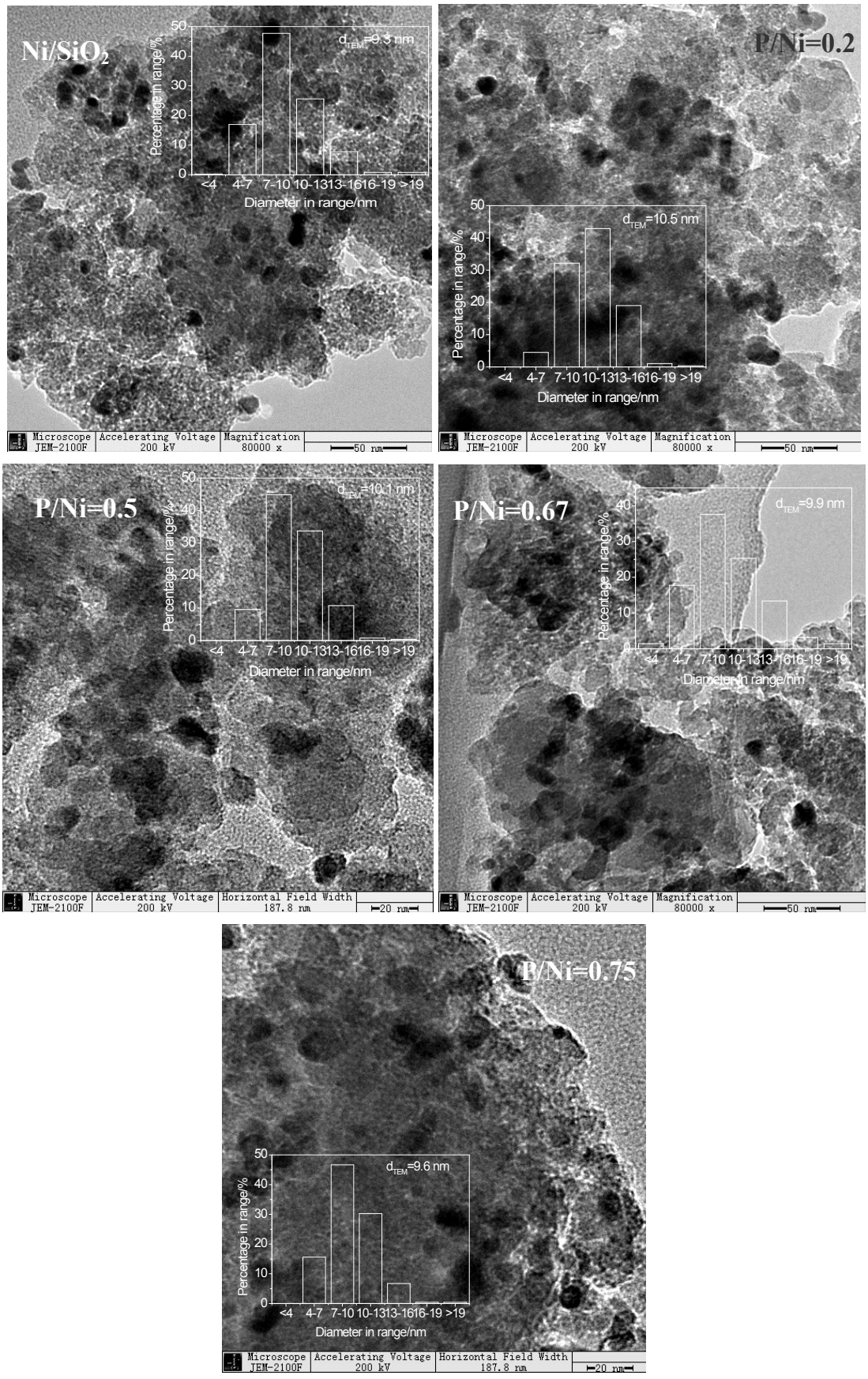

Figure 3S TEM images of Ni/SiO_2 and the SiO_2-supported nickel phosphides prepared at different nominal P/Ni ratios

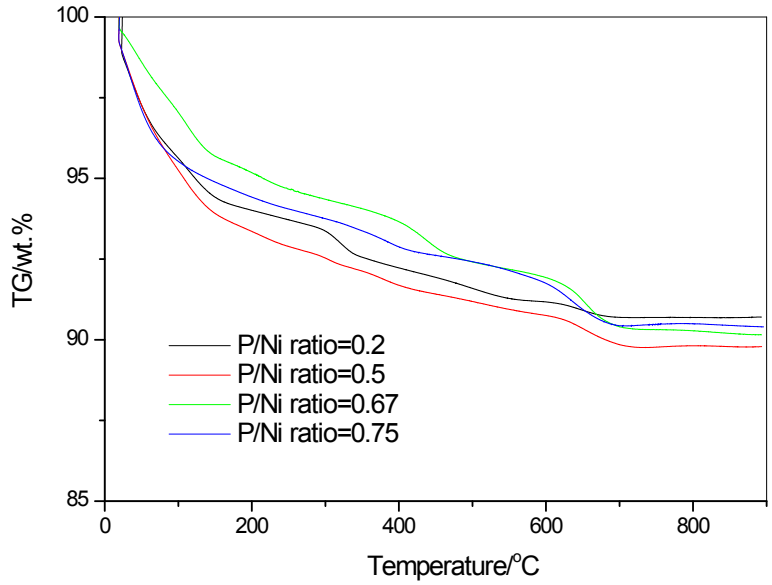

Figure 4S TG profiles of the SiO_2-supported nickel phosphides prepared with different nominal P/Ni ratios at 400 °C

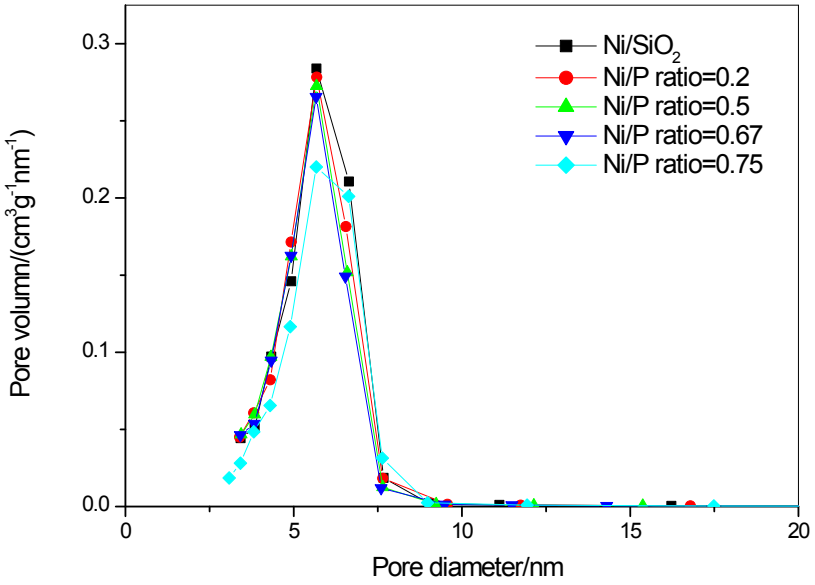

Figure 5S BJH pore size distributions of Ni/SiO_2 and SiO_2-supported nickel phosphides prepared at different nominal P/Ni ratios. Other condition: 400 °C, WHSV of TPP = 0.5 h^{-1}, H_2 flow

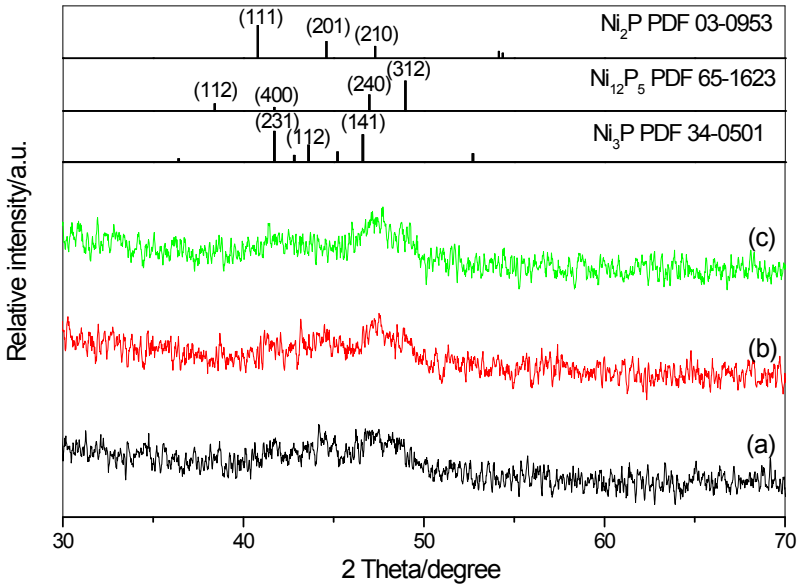

Figure 6S XRD patterns of the phosphorized samples at 200 ^{o}C with P/Ni ratio of (a) 0.75; (b) 1.0 and (c) 1.5

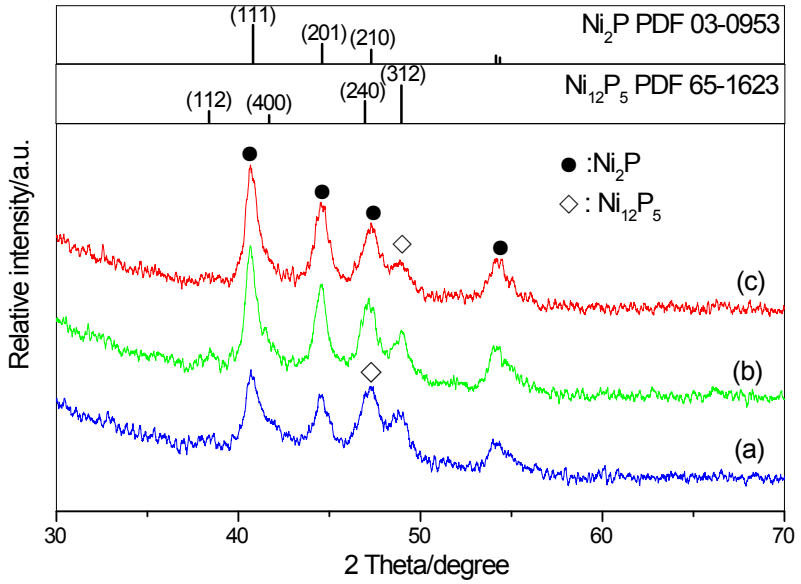

Figure 7S XRD patterns of (a) Ni/SiO_2-P150-300; (b) Ni/SiO_2-P200-300 and (c) Ni/SiO_2-P225-300

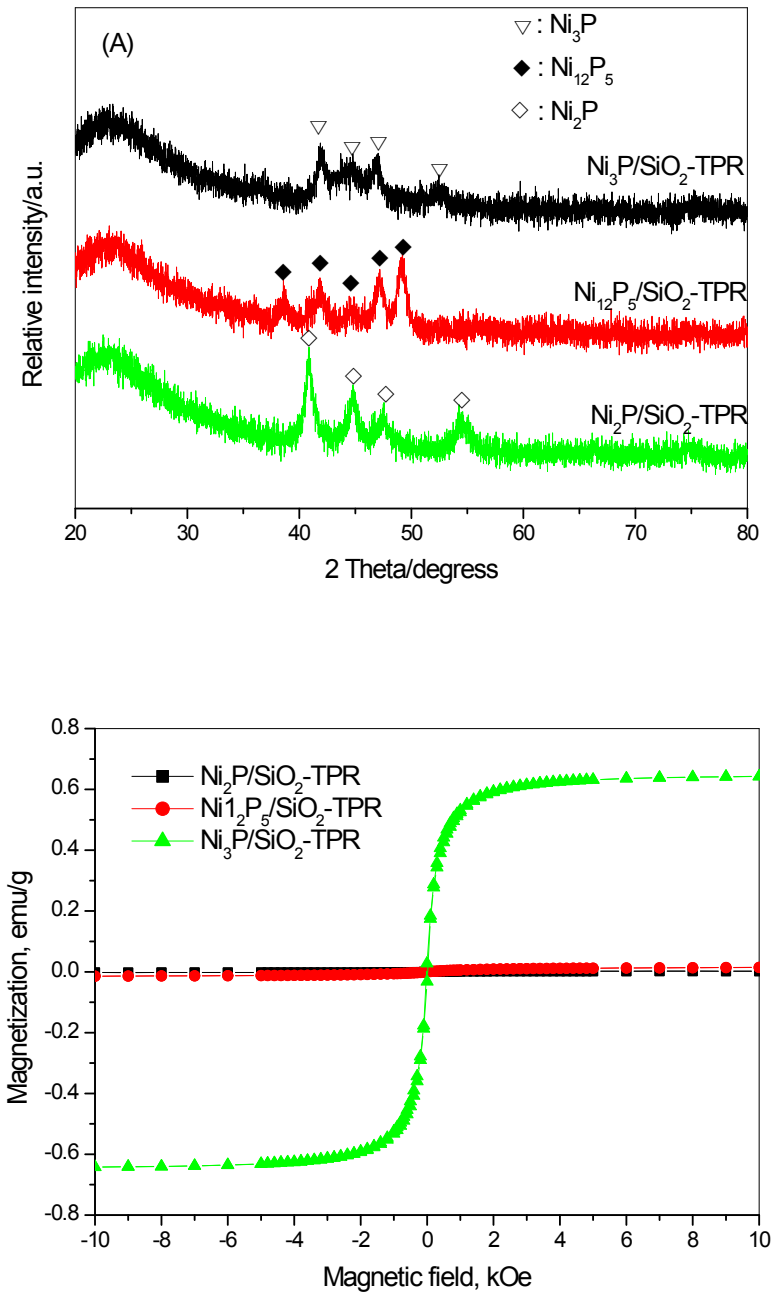

Figure 8S XRD patterns (A) and magnetic hysteresis loops at room temperature (B) of Ni_3P/SiO_2-TPR, $Ni_{12}P_5/SiO_2$-TPR and Ni_2P/SiO_2-TPR

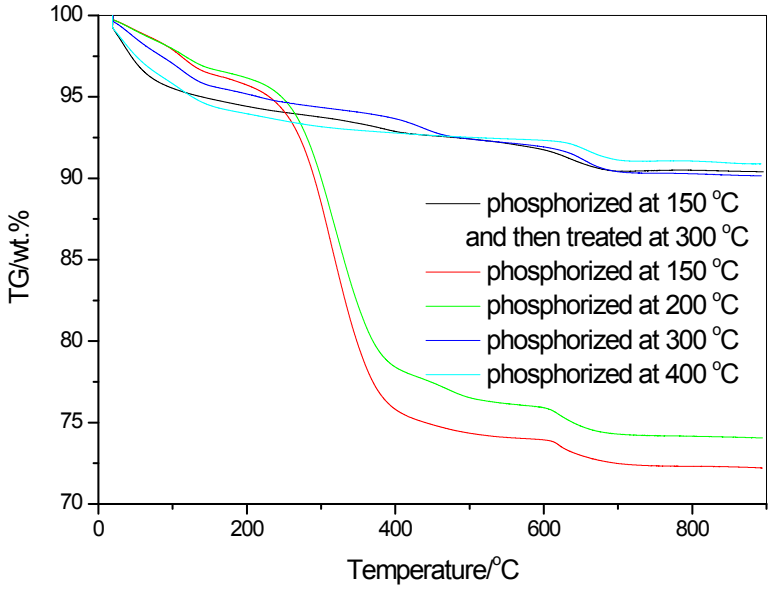

Figure 9S TGA profiles of samples phosphorized at different temperatures

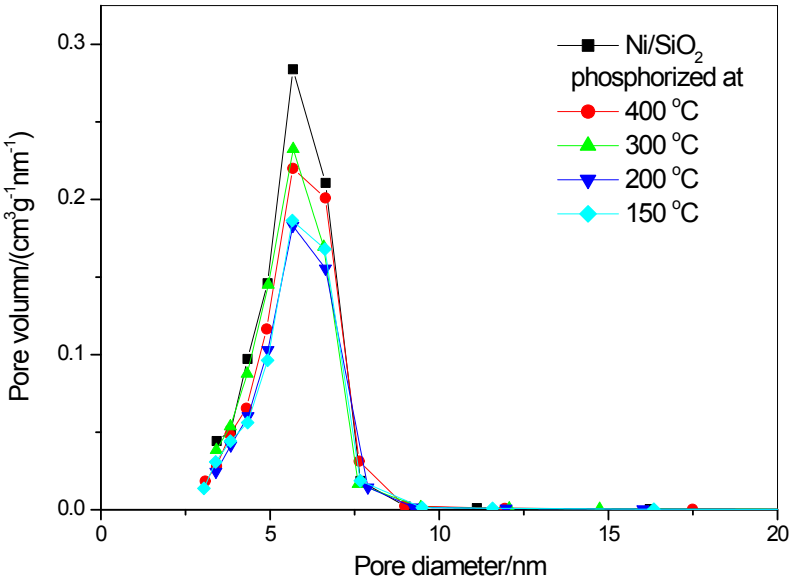

Figure 10S Pore size distributions of Ni/SiO_2 and SiO_2-supported nickel phosphides prepared at different temperatures. Other condition: nominal P/Ni ratio = 0.75, WHSV of TPP = 0.5 h^{-1}, H_2 flow.

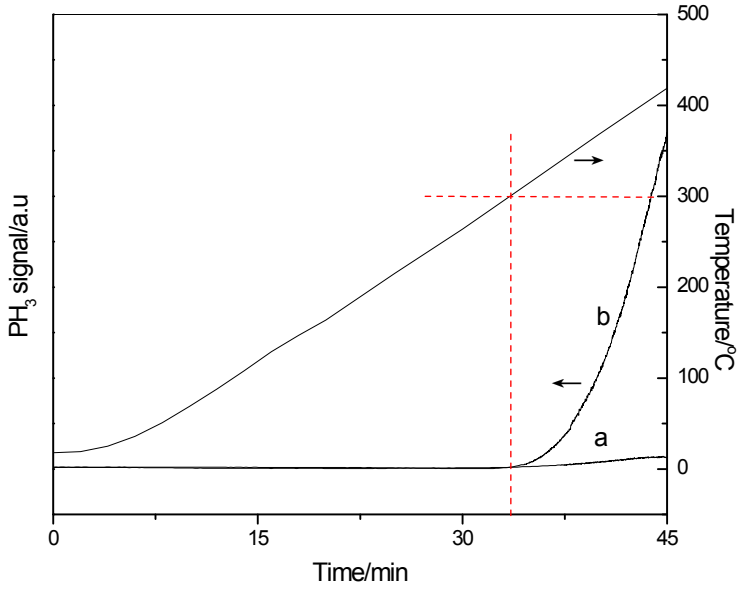

Figure 11S PH_3 (mass=34) signal during the hydrogenolysis of TPP on (a) SiO_2 and (b) Ni/SiO_2

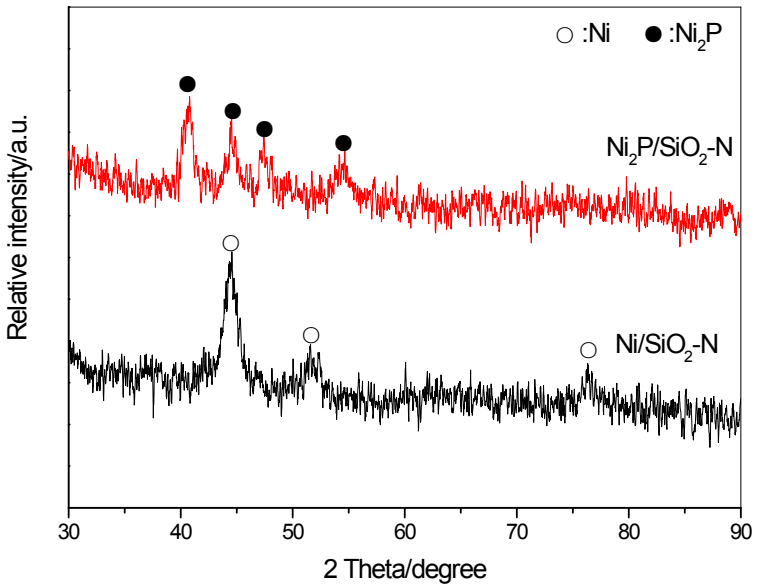

Figure 12S XRD patterns of Ni/SiO_2-N and Ni_2P/SiO_2-N

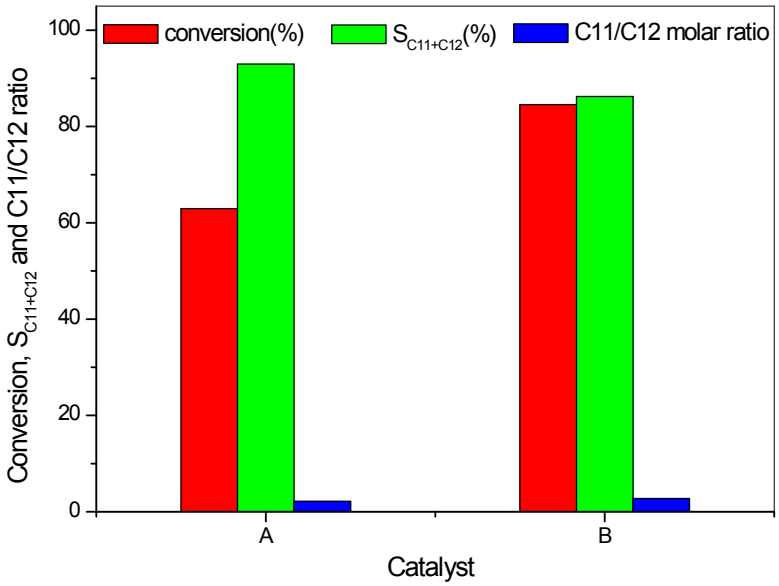

Figure 13S Comparison of performance of (A) Ni_2P/SiO_2 and (B) Ni_2P/SiO_2 -N