Anwaraporn Niltharach 2011: Sol-gel Synthesized Cerium Promoted TiO_2 as Cobalt Catalyst Support for Fischer-Tropsch Synthesis. Doctor of Philosophy (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Associate Professor Attera Worayingyong, Ph.D. 184 pages.

Cerium promoted TiO_2 samples were synthesized using a sol-gel method with different hydrolysis conditions; low and high water content (ratios of water to Ti-alkoxide precursor: *H*) and different cerium precursors. Mixture phases of anatase and rutile were investigated by X-ray diffraction (XRD) and X-ray absorption near edge structure (XANES). XANES spectra showed that hydrolysis resulted from both high and low cerium percentages of different cerium precursors [$Ce(acac)_3$ and $Ce(NO_3)_3$] did not show significant effect on the mixture phases. Instead, the spectra showed the effects of low and high water content. The low water content method (H = 4) produced mainly anatase phase. Raman spectra showed no peaks of CeO_2 for the promoted samples. Ce L_3-edge EXAFS spectra were used to investigate the localized sites of different cerium loading. Low percentage Ce/TiO_2 samples showed that the Ce ions in TiO_2 obtained the best fits using the interstitial defect simulations with Ce-O distances of 2.09 and 2.64 Å and Ce-Ti of 2.87 and 3.13 Å. For high percentage Ce/TiO_2 samples, EXAFS analysis showed that the Ce ions in TiO_2 gained both interstitial and substitution defect simulations with different ratios. From EXAFS results, it could be assumed that different Ce percentages performed different localized sites of Ce ions in TiO_2: the lower percentage resided as an interstitial site whereas the higher resided both an interstitial site and the Ti-substitution site in TiO_2. As for Fischer-Tropsch catalyst support, the low percentage of cerium ions in TiO_2 prepared by the low water content sol-gel method showed complete cobalt reduction at low temperature (550^oC) as resulted from temperature programmed reduction (TPR). Fischer-Tropsch synthesis with instantaneous total stream sampling analysis technique was tested and the gas products were analyzed using GC equipped FID.

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