Dispersed $NiWS_2$ Catalysts for Slurry Phase Hydrocracking of Vacuum Residue

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The catalytic activities of the dispersed $Ni_xW_{(1-x)}S_2$ catalysts were investigated at 693K, 9.5MPa H_2 with the same amount of catalyst loading of 0.113 mmol as a metal basis. The catalysts were prepared in situ in the VR HCK using nickel acetylacetonate and tungsten hexacarbonyl as Ni and W precursors, respectively. Structural properties of the dispersed catalysts were characterized by extended X-ray absorption fine structure (EXAFS) and transmission electron microscopy (TEM), which confirmed the formation of well dispersed $Ni_xW_{(1-x)}S_2$ phase in size ranges of 8-10 nm. Moreover, it was demonstrated that the alloyed metal sulfides of $Ni_xW_{(1-x)}S_2$ feature a promotional activity in the VR HCK, showing higher TOF_S in the VR HCK than mono-metal sulfides.