

Structure and Activity of Unsupported CoMoS₂ Catalysts for Slurry Phase Hydrocracking of Vacuum Residue

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A gradual depletion of conventional light crude oils has enabled the heavy oil upgrading technologies viable to meet the demands for the light oils in the near future. The hydrocracking (HCK) process of vacuum residue (VR) is a solution for the needs of the middle distillates with the superior conversion over the conventional processes. This work investigated the activity of the dispersed CoMoS₂ catalysts for the VR HCK, and the structure of Co-Mo-S phase by means of DFT and XAFS studies. The VR HCK reaction was conducted at 673K and 9.5 MPa H₂ in an autoclave batch reactor using the Mo-hexacarbonyl and Co-octoate as precursors. Overall, it was demonstrated that Co_xMo_(1-x) catalysts show better activity in the VR HCK than mono-metallic sulfides due to the Co-Mo-S phase of which morphology and dispersion being maintained until the fifth run of the recycles in the VR HCK.