니켈인화물 나노 촉매의 심도탈황 특성(Nanocrystalline Ni_2P catalysts for deep hydrodesulfurization)

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Nickel phosphide nanocrystals were synthesized by using a solution phase reaction of Ni (acac)2 and trioctylphosphine oxide (TOP) in the presence of coordinating solvent (trioctylphosphine oxide, TOPO). In this reaction, TOP works as a phosphorous precursor and coordinating solvent. TOPO is an extra coordinating solvent which prevents particles from aggregating during the formation of nanoparticles. XRD and EXAFS studies confirm that a Ni2P phase was successfully formed on Al2O3. TEM analysis showed that the particle size distribution of Ni2P/Al2O3–HT was in the range 20–30 nm, while the Ni2P/Al2O3–TOP gave rise to homogeneous nanoparticles of 5–9 nm in size. In agreement with the particle size distribution of Ni2P, the amount of CO uptake of the catalysts followed the sequence, Ni2P/Al2O3–TOP(148 μmol g−1) > Ni2P/Al2O3–HT(105 μmol g−1). As for the catalytic activity in HDS of 4,6-DMDBT, the Ni2P/Al2O3–TOP gave an HDS conversion of 75 %, which was much higher than that of Ni2P/Al2O3–HT catalyst which gave an HDS conversion of 50 %. These results thus demonstrate that the ligand stabilization is highly effective method to enhance the catalytic activity of the Ni2P/Al2O3 catalyst for deep HDS.