

Hydrotreating petroleum vacuum residues by supercritical hydrocarbon solvents

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Hydrotreating of petroleum vacuum residue (VR) conducted in the presence of activated carbon (AC) catalyst with several kinds of hydrocarbon solvents (n-hexane, n-dodecane, and toluene) in supercritical condition gave large amount of distillates (65%) with small hydrogen consumption. The results were obtained at temperatures of 400oC with pressure of hydrogen gas about 500PSI. With the same reaction condition, the quality of product oil could be controlled by changed the hydrocarbon solvents. By using n-hexane, the lightest boiling point solvent, the ratio of naphtha: middle distillate: gas oil was 1.36:0.75:1 whereas the ratio 2:2:1 by using n-dodecane or 0.08:0.68:1 by using toluene.

In addition, the influence of three kind of AC: fresh AC, spent AC and modified AC were investigated in the same reaction condition. The results with low coke (12.16wt %), high conversion (68.56wt %) and the good quality of the liquid (9.24wt% of naphtha, 27.12wt% of middle distillate, 31.77wt% of gas oil) obtained with this modified AC run with toluene suggest that the oxidation surface treatment of AC would be beneficial.