

**Effects on Organic Solvents on the Upgrading of Vacuum Residue**

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This study is focused on the effect of solvents having different H-donor index, asphaltene solubility and alkyl substitution. In order to confirm the solvent effect on the VR(vacuum residue) conversion the reaction tests were performed at 673K 10.0 MPa (N<sub>2</sub> or H<sub>2</sub>) in the presence of different H-donor index solvents. As a result, the precipitate yield was lowered with following the order; blank (42.2 wt%) > naphthalene (27.5 wt%) ≥ 1-methyl naphthalene (22.6 wt%) > decalin (14.4 wt%) > tetralin (3.4 wt%). The formation of precipitate was formal highly affected by H-donor index. Moreover, asphaltene solubility enhanced the fluidity of VR and reduced phase separation during the VR conversion. As a result, the coke formation followed the order: tridecane(32.7wt%) > heptane(34.2wt%) > hexane(36.4wt%). These results demonstrated that there is good qualitative agreement between coke reduction performance and the asphaltene solubility. The solvent of alkyl substitution produced more precipitate. 1-methyl naphthalene has similar H-donor index as decalin. However, it generated free radicals that can lead to increased coke formation about 50%. we verified that VR conversion was highly enhanced by h-donor solvents with high asphaltene solubility and low alkyl-substitution.