

Iranian Refinery Vacuum Residue Upgrading Using Microwave Irradiation: Effects of Catalyst Type and Amount

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Abstract : Microwave irradiation is an innovative technology in the petroleum industry. This kind of energy has been considered to convert vacuum residue of oil refineries into useful products. The advantages of microwaves energy are short time, fast heating, high energy efficiency, and precise process control. In this paper, the effects of catalyst type and amount have been investigated on upgrading of vacuum residue using microwave irradiation. The vacuum residue used in this research is from Tehran oil refinery, Iran. Additives include different catalysts, active carbon as sensitizer, and sodium borohydride as a solid hydrogen donor. Various catalysts contain iron, nickel, molybdenum disulfide, iron oxide and copper. The amount of catalysts in two cases of presence and absence of sodium borohydride have been evaluated. The objective parameters include temperature, asphaltene, viscosity, and API. The specifications of vacuum residue are API, 8.79, viscosity, 16391 cSt (60°C), asphaltene, 13.3 wt %. The results show that there is a significant difference between the effects of catalysts. Among the used catalysts, Fe powder is the best catalyst for upgrading vacuum residue using microwave irradiation and resulted in asphaltene reduction, 31.3 %; viscosity reduction, 76.43 %; and 23.43 % in API increase.

Keywords : asphaltene, microwave, upgrading, vacuum residue, viscosity

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