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Abstract

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Keywords

1. Introduction

2. Experimental section

3. Results and discussion

4. Conclusions

Acknowledgements

References

Figures and tables

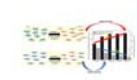
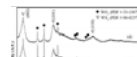
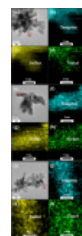
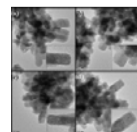


Table 1

Table 2



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Full Length Article

Hydrocracking of vacuum residue using NiWS(x) dispersed catalysts

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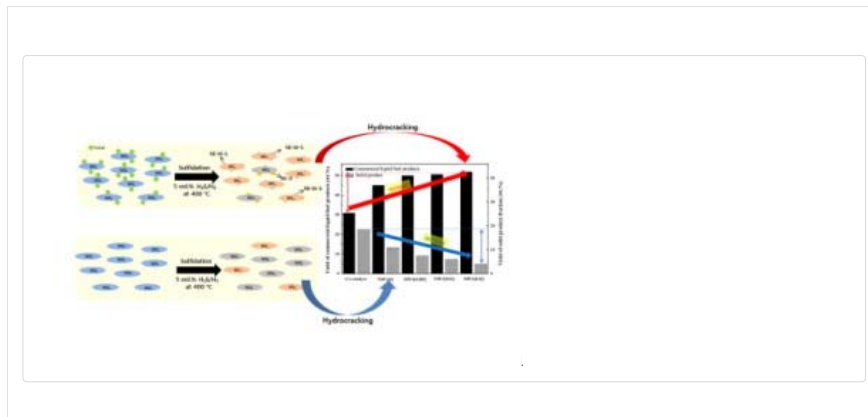
Highlights

- NiWS(x) particles were used as a dispersed catalyst in the hydrocracking of VR.
- The activity of the NiWS(x) catalyst was strongly affected by the Ni content.
- NiWS(0.02) exhibited the best hydrocracking activity.
- The NiWS(0.02) catalyst produced a lighter oil than commercial catalysts.
- There were improvements in the API gravity and sulfur removal conversion.

Abstract

In this study, unsupported nickel-tungsten sulfide (NiWS(x)) particles, where x is the actual molar ratio of Ni/W ($x = 0, 0.005, 0.01, 0.02$), were prepared, characterized with XRD, XPS, TEM, and EDX elemental mapping, and applied as a dispersed catalyst for upgrading of extra-heavy oil into good-quality liquid products. The hydrocracking reaction of vacuum residue (VR) was carried out at 400 °C with an initial H₂ pressure of 70 bar. It was found that an increase in the Ni content increases the degree of sulfidation of tungsten, promotes formation of Ni-W-S phases, and enhances the overall catalytic activity. Among the NiWS(x) dispersed catalysts, the NiWS(0.02) catalyst showed the highest performance in total liquid product yield (87.0 wt.%), commercial fuel fraction yield (51.9 wt.%), API gravity value of liquid product (14.3°), and sulfur removal conversion (86.5%). In addition, coke formation (4.0 wt.%) was efficiently suppressed, and the C₅-asphaltene conversion (81.8%) was significantly raised.

Graphical Abstract



Keywords

Vacuum residue; Hydrotreating; Hydrocracking; Dispersed catalyst; Ni-W-S catalyst

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