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Synthesis modulation as a useful tool to improve oxidation desulfurization in POM@UiO-66 nanocomposite

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Sulfur-containing compounds in petroleum products cause environmental pollution. Therefor, environmental concerns make restrictions to the sulfur content of fuels more and more exigent. Among the desulfurization processes, the oxidative desulfurization (ODS) technology has become as one of the most propitious techniques for obtaining fuel oil [1]. Porous metal-organic frameworks (MOFs) are a new porous crystalline materials have attracted significant attention as efficient catalysts ODS [2,3]. Defect engineering is as an advantageous synthetic tool for the introduction of structural point defects into MOFs to tune the physical-chemical properties and to modify their structure in oder to superior catalytic properties [4,5]. In this study, POM@UiO-66 nanoparticles were synthesized by encapsulation of polyoxometalate (POM) particles into a modulated-UiO-66 as catalyst. For this purpose, a monocarboxylic acid was used as the modulating agent to promote defect formation in UiO-66 and then was employed to investigatec atalytic activity. The experimental results showed that the novel POM@UiO-66 nanocomposite exhibits excellent efficiency for oxidative desulfurization in comparison with neat UiO-66 and some typical catalysts.

Keywords: Metal-Organic Frameworks, Polyoxometalate, Defect, Desulfurization

References

[1] A. Rajendran, T.-Y. Cui, H.-X. Fan, Z.-F. Yang, J. Feng and W.-Y. Li, A comprehensive review on oxidative desulfurization catalysts targeting clean energy and environment, J. Mater. Chem. A, 2020, 8, 2246–2285.

[2] M. Samaniyan, M. Mirzaei, R. Khajavian, H. Eshtiagh-Hosseini and C. Streb, Heterogeneous Catalysis by Polyoxometalates in Metal–Organic Frameworks, ACS Catalysis, 2019, 9, 10174 10191.

[3] L. Hao, M. J. Hurlock, X. Li, G. Ding, K. W. Kriegsman, X. Guo and Q. Zhang, Efficient oxidative desulfurization using a mesoporous Zr-based MOF, Catal. Today, 2020, 350, 64.

[4] Z. Fang, B. Bueken, D. E. De Vos and R. A. Fischer, Defect-Engineered Metal–Organic Frameworks, Angew. Chem. Int. Ed, 2015, 54, 7234–7254.

[5] W. Xiao, Q. Dong, Y. Wang, Y. Li, S. Deng and N. Zhang, Time modulation of defects in UiO-66 and application in oxidative desulfurization, CrystEngComm, 2018, 20, 5658.