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Title: Catalytic applications of metal-organic framework modified by yttrium containing sandwich polyoxometalate

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ABSTRACT

Polyoxometalates, including heteropolyoxometalates and isopolyoxometalates, can be used as excellent catalysts for both acid-catalyzed reactions and oxidation reactions [1]. The synthesis and characterization of new transition-metal-substituted (d-and f-block) polyoxometalates continues to be a focus of considerable ongoing research. Highly tunable nature of these compounds, coupled with their chemically robust nature, has led to applications in catalysis, medicine and molecular magnetism [2]. As homogeneous catalysts, polyoxometalates have a low specific surface area, and on the other hand, they are easily dissolved in polar environments, for this reason, it is difficult to recovery the catalyst [3]. Attempts to recover catalysts are of great interest [4]. In order to reach this goal, homogeneous catalysts must be converted into heterogeneous catalysts by different methods. One of these methods is to place the homogeneous catalyst on a solid support [5].
The A-type sandwich polyoxometalates of $[(PW_9O_{34})_2(H_2OYO)_3]^{15-}$ was immobilized for the first time into the porous metal-organic framework MIL-101(Cr). The new $P_2W_{18}Y_3$@MIL-101 nanocomposite characterized by means of FT-IR, XRD, TGA, SEM, EDX, BET analysis. The catalytic activity of heterogeneous catalyst was examined in the oxidation of sulfides to sulfones with H_2O_2 oxidant at room temperature. . The effects of different dosages of polyoxometalates, type of solvent, reaction time, amount of catalysts and oxidant in this catalytic system were investigated. The effect of temperature on stability and catalytic activity of the new $P_2W_{18}Y_3$@MIL-101 was investigated. The new new $P_2W_{18}Y_3$@MIL-101 nanocomposite exhibited well recyclability and reusability in at least five consecutive reaction cycles without significant loss of activity or selectivity.

Keywords: yttrium sandwich type polyoxometalate, MIL-101(Cr), composite, sulfides, sulfones

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