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PII: S1385-8947(16)31404-8
DOI: http://dx.doi.org/10.1016/j.cej.2016.10.003
Reference: CEJ 15858

To appear in: *Chemical Engineering Journal*

Received Date: 15 October 2015
Revised Date: 30 September 2016
Accepted Date: 1 October 2016

Please cite this article as: F-L. Yu, Q-Y. Wang, B. Yuan, C-X. Xie, S-T. Yu, Alkylation Desulfurization of FCC Gasoline over Organic-inorganic Heteropoly Acid Catalyst, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.10.003

# Alkylation Desulfurization of FCC Gasoline over Organic-inorganic Heteropoly Acid Catalyst

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**Abstract:**

The alkylation reaction of thiophenic sulfides with olefin in model fluid catalytic cracking (FCC) gasoline has been carried out over many kinds of organic-inorganic heteropoly acids, $H_3PW_{12}O_{40}$, and $AlPW_{12}O_{40}$. The results have showed that organic-inorganic heteropoly acid $[Bmim]H_2PW_{12}O_{40}$ exhibits the best catalytic activity for the alkylation of thiophene (T), 2-methyl thiophene (2-MT) and 3-methyl thiophene (3-MT). Many effect factors for the alkylation of thiophenic sulfides catalyzed by $[Bmim]H_2PW_{12}O_{40}$ have been fully investigated. Under the optimal reaction conditions (the catalyst dosage 1 wt%, reaction temperature 120 $^{o}$C, reaction time 40 min and the stirring rate 500 rpm), the conversions of T, 2-MT and 3-MT all can nearly reach up to 100%. $[Bmim]H_2PW_{12}O_{40}$ has also exhibited good stability and recyclability. The conversions of thiophenic sulfides nearly remain unchanged during 11 recycles of $[Bmim]H_2PW_{12}O_{40}$. Apparent reaction kinetics for the alkylation of thiophenic sulfides is studied. The alkylations of T, 2-MT and 3-MT all show the pseudo-first-order kinetic characteristics. The order of the reaction rate constants of three thiophenic sulfides is 2-MT>3-MT>T. However, the calculated apparent activation energies of T, 2-MT and 3-MT are 62, 45.54 and 71.33 kJ/mol, respectively. So, the order of apparent activation energies is 3-MT>T>2-MT.

**Key words**: alkylation; desulfurization; thiophenic sulfides; organic-inorganic heteropoly acids; FCC gasoline

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