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Generation of Active Protonic Acid Site From Cyclohexane Over Pt/SO_4^{2-}-Al_2O_3Catalyst

S. Triwahyono[1,2] & A.A. Jalil[3,4]

[1]Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
[2]Ibnu Sina Institute for Fundamental Science Studies, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
[3]Institute of Hydrogen Economy, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
[4]Department of Chemical Engineering, Faculty of Chemical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

Generation of active protonic acid sites for isomerisation of cyclohexane over Pt/SO_4^{2-}-Al_2O_3 catalyst was studied. Pt/SO_4^{2-}-Al_2O_3 was synthesized and calcined at 823K. Characterization was carried out with XRD, BET ammonia-TPD, pyridine-preadsorbed IR spectroscopy, and FTIR. The XRD result showed that the addition of Pt and SO_4^{2-} did not change the phase of γ-Al_2O_3. The specific surface area of Pt/SO_4^{2-}-Al_2O_3 was 163 m^2/g. Pyridine-preadsorption study showed that Pt/SO_4^{2-}-Al_2O_3 consists of protonic acid and Lewis acid sites which appear at wavenumber of 1455 cm^{-1} and 1545 cm^{-1}. The ratio of extinction coefficient,$\varepsilon_{1455}/\varepsilon_{1545}$ was 2.0. In the absence of hydrogen, isomerization of cyclohexane resulted 3% and 85% of conversion of cyclohexane and selectivity of methyl-cyclopentane, respectively. These results indicated that the isomerisation occurs although in the absence of hydrogen. Generation of protonic acid sites from cyclohexane was observed by pyridine-preadsorbed FTIR, where protonic acid sites were formed and Lewis acid sites were decreased in the heating of Pt/SO_4^{2-}-Al_2O_3 in cyclohexane. This phenomenon indicated that the formation of protonic acid sites induced by cyclohexane is a reversible process. Generation of active site from cyclohexane is widely applicable concept for active sites over Pt/SO_4^{2-}-Al_2O_3.

Key Words:*Pt/SO_4^{2-}-Al_2O_3, cyclohexane, isomerisation, protonic acid sites, Lewis acid sites.*

Prof. Dr. Sugeng Triwahyono

[1]Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
[2]Ibnu Sina Institute for Fundamental Science Studies, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

Email : sugeng@utm.my
http://www.sugengdirect.com