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October 9-11, 2017
Malang, Indonesia

OP-29

Porous Kaolin-Phosphotungstic Acid Composites as Heterogeneous Catalyst for Friedel-Crafts Acylation of Anisole

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Keywords: acylation, anisole, gas chromatography, porous kaolin, phosphotungstic acid

Friedel-Crafts acylations are of great importance in industry and are typically carried out by using significant amount of homogeneous acid catalysts [1]. However, the process has produced a large amount of hazardous waste, undesirable products and difficulty in separation [2]. In this work, we reported phosphotungstic acid (HPW) supported onto porous kaolin (PK) as heterogeneous catalysis PK/HPW for the acylation of anisole with propionic anhydride as an acylating agent. A series of PK/xHPW catalysts were successfully prepared with concentration of 10–40 wt% (x is the concentration of HPW) using wet impregnation method. By using pyridine adsorption-FTIR spectroscopy, acidity studies showed that porous kaolin possessed strong Lewis acid sites. In contrast, the surface acidity of the PK/HPW catalysts increased and almost comprised of strong Brönsted acid sites. The catalytic activity was evaluated using gas chromatography with flame ionization detector (GC-FID) consisting of HP-5 column (100% dimethylpolysiloxane, 25 x 0.20 mm I.D). Moreover, analysis of a product as *p*-methoxypropiophenone was carried out using GC with mass spectrometer (GC-MS) detector equipped with the same column. After 3 hours at 100 °C, the PK/30HPW catalyst (70 mg under solvent-free condition) in the mixture of anisole (30 mmol) and propionic anhydride (30 mmol) showed excellent catalytic activity with 86% conversion and high selectivity in 95% toward *p*-methoxypropiophenone. This result indicates the importance of Brönsted acid sites of well-dispersed HPW onto porous materials with balance of total pore volume and hierarchical factor value (ratio of mesoporosity to microporosity).

References:
[1] Spagnol, M., Gilbert, L. & Alby, D. 1996. In: J. R. Desmurs, S. Ratloy (Eds.). The Roots of Organic Development. Amsterdam: Elsevier.
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