

Synthesis of Iso-Amyl, Benzyl and Cinnamyl Esters over Active, Selective, Reusable and Eco-Friendly Natural Silica Catalyst

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Abstract : In this study, natural silica was used as an active, selective, reusable and eco-friendly catalyst for the liquid phase synthesis of iso-amyl, benzyl and cinnamyl esters. The original and calcined natural silica were characterized by TG-DTA, XRF, XRD, FTIR, SEM, and N₂-sorption analysis. The surface acidity of the catalysts was determined using isopropanol dehydration and the strength of available acid sites was measured using chemisorption of pyridine (PY) and dimethyl pyridine (DMPY). The results of acidity specified that the acidic sites are of Brønsted type, while PY-TPD demonstrated that almost of the acidic sites over the surface of natural silica are of weak and intermediate strength. The catalytic activity of natural silica towards esterification of acetic acid with alcohols was extensively studied. The results revealed that natural silica had high catalytic activity with 100% selectivity to all targeted esters. In addition, the yields obtained in batch methods were 83, 81, and 80%, respectively, whereas these yields after simple distillation were improved 97, 99.5, and 90%, respectively.

Keywords : liquid-phase esterification, natural silica, acidity esters, characterization

Conference Title : ICBECE 2020 : International Conference on Biogeochemistry and Environmental Chemistry

Conference Location : Berlin, Germany

Conference Dates : July 23-24, 2020