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Production of renewable aromatics from thermochemical conversion of biomass derived materials

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The catalytic conversions of canola oil and canola oil methyl ester (CME) for the production of green aromatics over a Zn-modified HZSM-5 catalyst were investigated. The catalysts were prepared by incipient wetness impregnation method. Several techniques were used in characterization of the catalysts: X-ray diffraction, scanning electron microscopy, transmission electron microscopy, N_2 adsorption-desorption and ammonia temperature-programmed desorption. The effects of reaction temperature and weight hourly space velocity (WHSV) on the aromatics yields were investigated. The reactor was operated at atmospheric pressure, temperatures at 400 and 450°C and space velocities of 2 and 4 hr^{-1}. The main products were liquid hydrocarbon product (LHP), gases and water. Gas chromatography (GC) analysis was applied to determine the BTX content of the LHP. Similar aromatic products distributions were obtained in the presence of un-promoted as well as Zn-promoted HZSM-5 catalysts. Toluene was the major aromatic compound followed by para-meta xylenes and benzene. The addition of zinc species to HZSM-5 catalyst promoted the aromatization capacity of the catalyst. The maximum aromatic yield of 42.6% was achieved at 450°C and 2 h^{-1} over 4Zn/ZS catalyst.

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Green process for conversion of cellulosic bamboo biomass to reducing sugar

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Non-renewability of fossil fuels and the challenges associated with its utilization such as price fluctuation due to political instability of oil rich regions, environmental concerns, imbalance between energy supply and population growth and uneven distribution of these resources in the globe are some of the compelling factors to research for sustainable and renewable energy resources. Biomass is one of the most promising candidate along with solar, wind and hydrothermal energies for sustainable and renewable energy demand. Being the most abundant and bio-renewable resource, lignocellulosic biomass has the potential to serve as feed stock for the production of second generation bioethanol and platform chemicals without computing with food supply. Lignocellulosic biomass is composed of three bio-polymeric components: cellulose (35–50%), hemicellulose (20–35%) and lignin (5–30%). In this work, hydrolysis of cellulosic bamboo biomass (CBB) was investigate for sugar production using the most commonly known hydrophilic ionic liquid, 1-butyl3-methyl imidazolium chloride ([BMIM] Cl), in the presence of sulphuric acid. CBB was regenerated from the alkaline pre-treatment of bamboo biomass and subsequently dissoloution in [BMIM] Cl and was then hydrolyzed using sulphuric acid. The effect of [BMIM] Cl prior dissolution on the crystallinity index, morphology, chemical and thermal properties was investigated using XRD, SEM, FTIR and TGA characterization methods. The amount of total reducing sugar (TRS) produced was determined by 3, 5-dinitrisalcylic acid (DNS) method using UV-Visible spectroscopy. Glucose, cellobiose and 5-hydroxylmethylfurfural were analysed using high performance liquid chromatograph. It was observed that CBB prior dissolution in [BMIM] Cl, effectively enhanced the yield of TRS (90%).

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