

Title: Conversion of biomass-derived phenolics into C_{10}-C_{13} fuel precursors and value-added chemicals over green heterogeneous catalysts

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Abstract (250-300 words)

Pyrolysis of waste lignocellulosic biomass leads to formation of liquid bio-oil which is composed of major proportion of phenolic compounds and oxygenated carbon fractions, along with char. Further, hydrodeoxygenation at high temperature and pressure is commonly performed to make these bio-oils compatible with crude fossil-fuels. However, this process results in the loss of oxygenated carbon fraction by gasification. Upgrading by C−C coupling between the phenolics and light oxygenates to retain the maximum amount of carbon in the fuel range (C_{10}-C_{13}) prior to hydrodeoxygenation step can prove to be highly advantageous. In this contribution, selective formation of C_{10}-C_{13} range fuel precursors by gas-phase alkylation of *m*-cresol (a lignin derivative) with *iso*-propanol (light oxygenates) over highly efficient metal ion-exchanged zeolite catalysts was performed. Among all the catalysts, a *m*-cresol conversion of ~92% with ~71% selectivity to desired product thymol was obtained over highly Lewis acidic zinc metal-ion exchanged HY zeolite containing 0.99 mmol g^{-1} zinc. A comprehensive optimization of important process parameters like reaction temperature (200–300 °C), WHSV (1.68–3.92 h^{-1}), *iso*-propanol to *m*-cresol mole ratio (1:1–3:1), and catalyst loading (0.5–1.5 g) were performed using Design of Experiment (DoE) through Response Surface Methodology (RSM) and validated with experimental data. High coefficient of determination value (R^2) of 98.65% for conversion of *m*-cresol and 98.37% for selectivity to thymol confirmed the goodness of fit of the second order polynomial regression model. 250 °C temperature, 2.8 h^{-1} WHSV, 2:1 reactant mole ratio, and 1 g catalyst loading was found to be optimum for this reaction.

Biography(100-150 words)

Gul Afreen is pursuing PhD on the topic "Catalytic upgradation of biomass-derived phenolic compounds" in Chemical Engineering Department, Indian Institute of Technology Delhi, India under supervision of Professor Sreedevi Upadhyayula. She has completed her M. Tech in Nanotechnology from Aligarh Muslim University, Aligarh and B.Tech in Biotechnology from Amity University, Lucknow, India. She has secured the highest marks in graduation which encouraged her to go for higher studies rather than securing a corporate job.

Her research interests include environmentally benign heterogeneous catalysis, petrochemical and refinery catalytic processes, catalytic manufacturing of fine chemicals in green chemistry route, biomass conversion to biofuels, and waste-water treatment. At present, she has published five articles and two are in review after revision in renowned international journals.

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