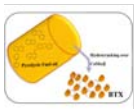
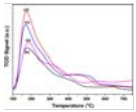
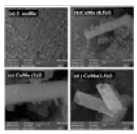
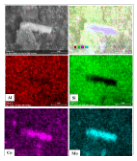


Table 1







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Selective hydrocracking of pyrolysis fuel oil into benzene, toluene and xylene over CoMo/beta zeolite catalyst

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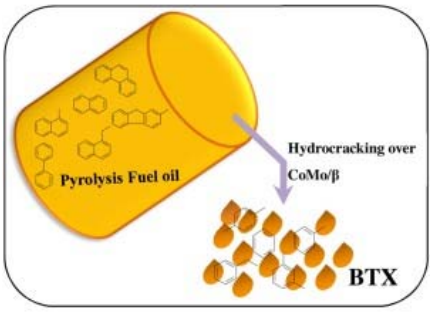
Highlights

- Co promoted Mo/β catalyst has showed superior catalytic performance in hydrocracking of model compounds as well as crude pyrolysis fuel oil into BTX.
- Catalysts and reaction parameters optimization in hydrocracking of tetralin helps to conduct the efficient hydrocracking of PFO into BTX.
- Surface and morphological properties in CoMo/β catalyst was observed to be varied with the loading of Co, and it could strongly affect their catalytic activity.
- Along with the superior catalytic activity, CoMo/β catalyst provided long term stability in continuous flow reaction without any significant deactivation.

Abstract

Cobalt promoted Mo/β (Beta zeolite) catalysts were prepared with different metallic loadings (0.5–1.5) by a co-impregnation method. The catalytic activities of the synthesized catalysts were investigated for the selective hydrocracking of tetralin and pyrolysis fuel oil (PFO) into mono-aromatic hydrocarbons (MAH) such as benzene, toluene and xylene (BTX) in a fixed-bed reactor system. Prior to using the CoMo/β catalyst for crude PFO hydrocracking, different reaction parameters (including metallic loading, temperature, H_2 pressure, and LHSV) were investigated for the hydrocracking of a model feed, tetralin, to determine the best conditions for maximum BTX yield. The CoMo(0.5)/β catalyst with a Co/Mo ratio of 0.5 produced the highest MAH yield of 62.6% at 99.5% conversion of tetralin, continuously for 140 h of reaction time without any deactivation. Furthermore, the CoMo(0.5)/β catalyst was found to be superior among the tested CoMo/β catalysts for hydrocracking real feed PFO, and it produced a maximum MAH yield of 54.8% at 99.1% conversion of PFO. The synthesized catalysts were characterized using different characterization techniques, including BET, NH_3-TPD, SEM-EDS and ICP, to evaluate their physiochemical properties and determine the active sites present in the catalysts.

Graphical abstract



Keywords

Pyrolysis fuel oil; CoMo catalysts; Parameter optimization; Hydrocracking

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