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Co-FCC of Biomass-Derived Feedstock within the FASTCARD Project

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Abstract

The European Union (EU) has set itself the 20-20-20 targets. Despite other goals, these aim for a share of 20% of renewables within the energy sector till the year 2020. For the transport fuel sector, 10% renewables are pursued. In order to reach this goal, a shift towards biomass is needed. Especially lignocellulosic biomass is an attractive source for the production of carbon-based fuels. For example, forest residues can be converted by pyrolysis into an oil. This oil can be co-fed with vacuum gas oil (VGO) into the fluid catalytic cracking (FCC) process, which is called Co-FCC. Within the EU project FASTCARD, the biomass pyrolysis and the Co-FCC were studied in one line.

We investigated the hydrothermal stability of a variety of medium- and large-pore zeolites at elevated temperatures to examine their suitability as catalyst for Co-FCC. Afterwards, zeolites that were claimed as stable were further used as catalysts in the co-cracking of model compounds. For a VGO oil n-decane and for an HDO oil 2-ethylphenol were used. Experiments were conducted in the gas phase in a fixed-bed reactor at a low weight hourly space velocity in order to observe catalyst deactivation within a reasonable timeframe.

Results revealed that several zeolite structures besides the commonly used FAU structure show good hydrothermal stability and might therefore be potential candidates as catalyst or additive in FCC [1]. However, co-cracking of n-decane with 2-ethylphenol requires the use of large-pore zeolites. Furthermore, only the investigated FAU zeolites are able to convert the phenolic co-substrate into aromatics. This is believed to be due to the good H-transfer with this type of zeolite and underlines its outstanding activity - not only in general FCC but also for an application in Co-FCC [2].

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[2] M. Heuchel, C. Dörr, R. Boldushevskii, S. Lang, E. Klemm, Y. Traa, Appl. Catal. A 553 (2018) 91-106.