Petrochemistry and Refining in a Changing Raw Materials Landscape
DGMK Conference October 9 – 11, 2017 in Dresden, Germany

Effects of NiMo-loading on Al-MCM-41/ZSM-5 Composite Materials During Hydrogen-assisted Catalytic Cracking of Ethyl Laurate

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Abstract

The principles of sustainability introduced by *Anastas* and *Warner* not only taught us to use regenerative resources like fatty acids more widely. Moreover, we should use them in the most efficient possible manner. Therefor studies have to be done in any reasonable direction. One important industrial application for biogenic resources could be the conversion in a hydrocracking process using NiMo-loaded solid acid catalyst systems.
Addressing the most valuable product fraction *(short-chained olefins)* within this process it is necessary to reduce the hydrogen-pressure used during the reaction. This results in changing the process itself from a hydrocracking to a hydrogen-assisted catalytic cracking. By this the deactivation behaviour of the catalyst system varies dramatically and the product domination flips from paraffins to olefins.
For theses variations, the effects of a nickel and molybdenum loading on a micro/mesoporous composite material Al-MCM-41/ZSM-5 are investigated during the hydrogen-assisted catalytic cracking of ethyl laurate. Thereby the ester acts as a model substance for fatty acids in special and biogenic resources in general.

It can be shown that nickel influences the long-time stability of the catalyst system by a provided spill-over effect increasing the hydrogenation possibilities of formed coke by elemental nickel. The amount of molybdenum modifies the selectivity towards the desired product fraction. Furthermore, the impregnation method *(co-impregnation, step-wise impregnation)* has a major impact on the performance of the catalyst system.

The variation of long-time stability in this system results always in a modification of product formation selectivity. Because of this interplay both influences have to be accounted simultaneously to calculate the crucial catalyst performance for different industrial problems.