FAST CARD Newsletter

FASTCARD - FAST industrialisation by CAtalysts Research and Development

No. 6, September 2017

FASTCARD Project Meeting 10-11 January 2017 in Worms, Germany

The EU FP7-funded project FASTCARD had its seventh meeting with 37 participants from 8 different countries in Worms at the Parkhotel Prinz Carl on 10-11 January 2017 (Fig. 1). The meeting started with an Exploitation Seminar in the morning of January 10 with Gerhard Goldbeck from Goldbeck Consulting, where possibilities for exploitation were fathomed. In the afternoon, the work sessions of the different work packages and also joint sessions took place. On January 11, there was the general assembly in the morning and a plant tour at the GRACE site in the afternoon (Fig. 1).

Figure 1: Exploitation seminar, dinner and visit of the GRACE site.

FASTCARD Project Meeting 27-28 June 2017 in Enschede, Netherlands

The eighth meeting of the FASTCARD project took place in the heart of Enschede at the Oude Markt on 27-28 June 2017. After the work sessions of the first day, there was a guided tour through the architecture showcase Roombeek and finally a fabulous dinner at the Gastrobar Bij Rozendaal. After the general assembly on the second day, BTG and the fast pyrolysis demonstration plant at Empyro could be visited (Fig. 2).

Figure 2: General assembly at SamSam, dinner at Rozendaal and visit of Empyro.

New Publications from the FASTCARD Project

Fig. 3 shows a result from a new publication which resulted within WP1 (hydrocarbon reforming). Fe-Ni catalysts present high activity in dry reforming of methane, but suffer from deactivation via sintering and Fe segregation. This work shows that enhanced control of the stability and activity of Fe-Ni/MgAl2O4 could be achieved by addition of Pd. In the as-prepared sample, Ni, Fe and Pd form clusters as oxides, while upon reduction the elements are redistributed, resulting in the formation of a core which is close to bimetallic Ni-Fe, while the surface is truly trimetallic Ni-Fe-Pd. This Fe-Ni-Pd surface layer acts as a barrier for Fe segregation from the core.

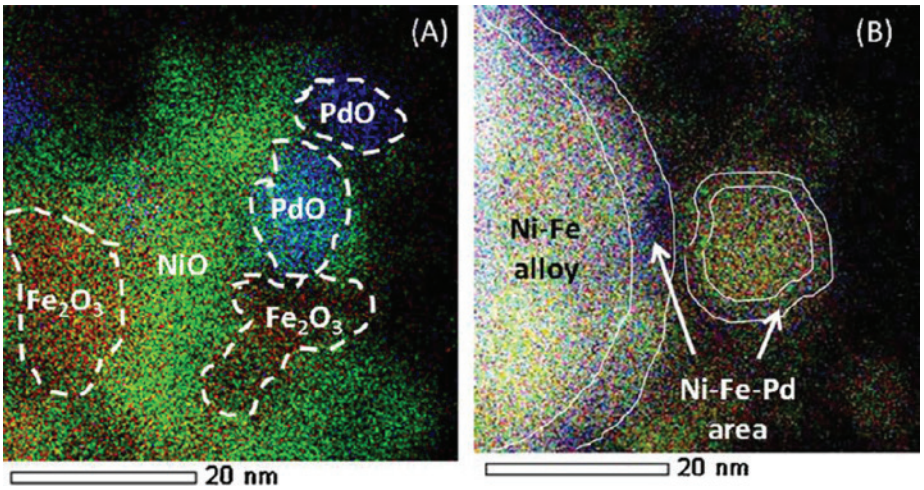


Figure 3: EDX element mapping of Pd-Fe-Ni/MgAl2O4. (A) as-prepared (B) reduced. Red, green and blue colors correspond to Fe, Ni and Pd elements, respectively (S. A. Theofanidis, V. V. Galvita, M. Sabbe, H. Poelman, C. Detavernier, G. B. Marin, Appl. Catal. B: Environmental 209 (2017) 405).

Fig. 4 is related to WP3 (Hydrotreating) and WP4 (Co-FCC). Co-refining of biomass-derived pyrolysis liquids in a Fluid Catalytic Cracking (FCC) unit with crude oil fractions is a promising route to produce second-generation biofuels. To improve the yield and ensure the fuel quality after co-processing, a hydrotreating step can precede co-processing. In this work, an optimum of the octane number of the resulting product was achieved with mildly hydrotreated pyrolysis liquids, thus saving valuable H2.

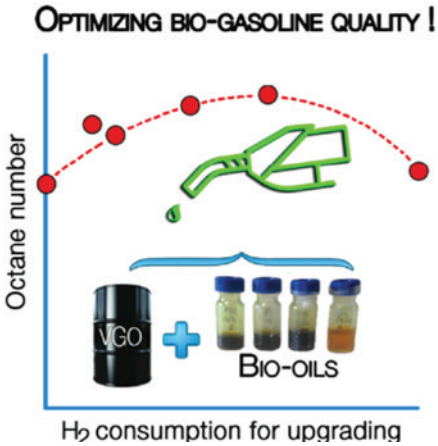
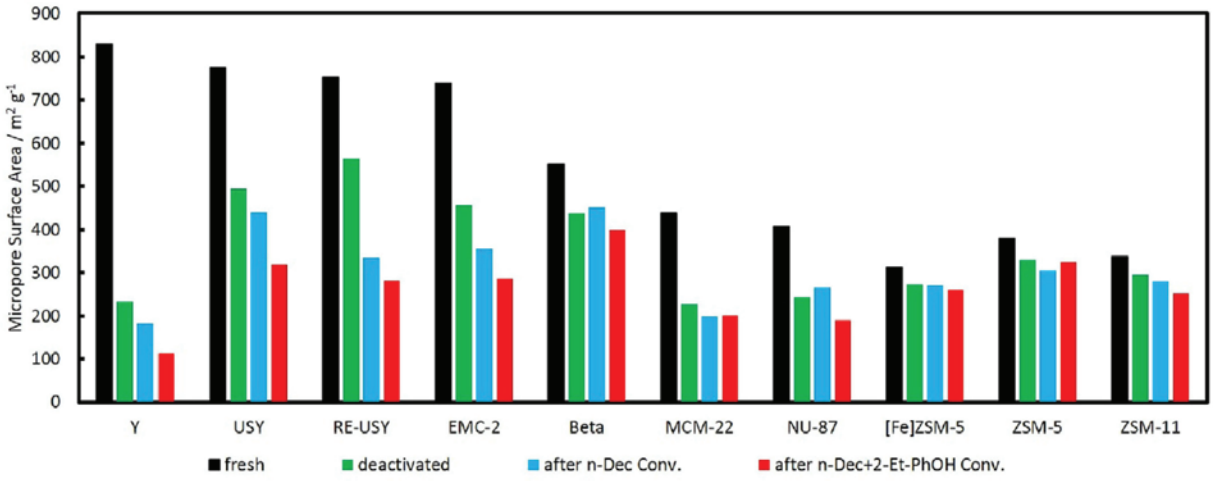


Figure 4 (above): During co-refining of biomass-derived pyrolysis liquids in an FCC unit with vacuum gas oil (VGO) as crude oil fraction, an optimum in the naphtha quality in terms of octane rating was found as a function of the pyrolysis liquids upgrading severity (L. Gueudré, F. Chapon, C. Mirodatos, Y. Schuurman, R. Venderbosch, E. Jordan, S. Wellach, R. Miravalles Gutierrez, Fuel 192 (2017) 60).

Fig. 5 shows a result from a publication which resulted within WP4 (Co-FCC). Different zeolites as active components for Co-FCC catalysts were studied. Hydrothermal deactivation and coking with the two different model feeds, i.e., n-decane for vacuum gas oil and 2-ethylphenol for pyrolysis oil have an influence on the porosity of the studied zeolites by destruction of the zeolite crystals and coking, respectively.

A large decrease of the micropore surface area is observed after the hydrothermal deactivation at 700 °C, especially for the FAU/EMT materials. The n-decane feed leads to a further decrease in micropore surface area due to coking. Finally, the mixed feed results in the lowest micropore surface area, which is in agreement with the coking tendency for both feeds. The good stability in n-decane cracking for medium-pore zeolites and Beta is reflected in the only slightly altered micropore surface after the reaction.

Figure 5 (below): Change of micropore surface area. Fresh, hydrothermally deactivated (700 °C) and coked (pure n-decane and mixed feed cracking) zeolites are shown (M. Heuchel, F. Reinhardt, N. Merdanoğlu, E. Klemm, Y. Traa, Microporous and Mesoporous Materials (2017), http://dx.doi.org/10.1016/j.micromeso.2017.05.005).



The second summer course within FASTCARD took place in Firenze in August 2017 directly before EuropaCat 2017.