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Quality improvement of light gasoline fractions from alternative sources

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Sustainable production of alternative fuels is a challenge at least partially to tackle the environmental problems resulting from the general use of fossil fuels. In addition the foreseen decreasing of fossil reserves is other driver for the search of renewable alternative energy sources. The latest directive of the European Union requires the production of fuels from non-edible, renewable or waste feedstocks. The main alternative component of gasolines is the bioethanol. However the conversion processes of alternative feedstocks (e. g. biomass, waste) to different fuels result in formation of light hydrocarbons (e.g. C_5/C_6 as side-products) in boiling range of gasolines in significant amount, too. The properties of the C_5/C_6 fractions need to be improved, for example because of low octane number (<60), poor oxidation stability (high olefin content). For increasing of octane number of C_5/C_6 fractions the most suitable process is the skeletal isomerization of the normal paraffins to branched alkanes. According the aim of our experiments was the isomerization of C_5/C_6 bioparaffin fractions obtained as side-products by the special hydrocracking of waste cooking oil to hydrocarbons in boiling range of diesel/JET fuels. Over Pt/Al_2O_3/chlorine catalyst (after drying "*in situ*" chlorinated in a down flow tubular reactor) the C_5/C_6 mixture was isomerized in once-trough operation mode (110-150°C; 1.0-3.0 h^{-1} liquid hourly space velocity; 30 bar; H_2/hydrocarbon molar ratio: 1:1). The approach values of the thermodynamic equilibrium concentrations for individuals components in products (obtained at favorable process conditions) were >75-90%. The increase of research octane number of product (compared to the feedstock) was >20 units. By the separation of normal paraffins of the products the C_5/C_6 isoparaffin mixture could have a high octane number (>92). Accordingly the utilization of isomerized C_5/C_6 fraction side-product of bio gas oil processing (rich in normal paraffins) can contribute to the competitiveness of second generation bio-fuels.

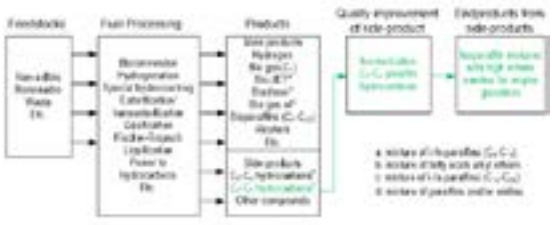

Figure 1: Schema of engine fuel production from alternative sources (e.g. light paraffin mixtures)

Recent Publications

1. Srivastava S P and Hancsók J (2014) Fuels and Fuel-Additives. John Wiley & Sons, Inc., Hoboken, New Jersey, USA, pp. 376.
2. Bezergianni S, Aggeliki K and Athanasios D (2012) Catalyst evaluation for waste cooking oil hydroprocessing. Fuel 93:638-641.
3. Kubicka D and Tukac V (2013) Hydrotreating of triglyceride-based feedstock in refineries. Advances in Chemical Engineering 42:141-194.

4. Heriyanto H, Murti S, Heriyanti S, Sholehah I and Rahmawati A (2018) Synthesis of green diesel from waste cooking oil through hydrodeoxygenation technology with NiMo/γ-Al2O3 catalysts. MATEC Web of Conferences DOI:10.1051/matecconf/201815603032

5. Zhang Z, Wang Q, Chen H and Zhang X (2018) Hydro conversion of waste cooking oil into bio jet fuel over a hierarchical NiMo/USY@ Al SBA 15 Zeolite. Chemical Engineering & Technology 413:590-597.

Biography

Hancsók J is a Doctor of Hungarian Academy of Sciences and Professor of MOL Department of Hydrocarbon and Coal Processing at the University of Pannonia and Consultant of the International Oil and Gas Company (MOL Plc.). He devotes his research to the study and development of engine fuels, engine oils and their additives, working with both fossil and renewable energy sources. He is author and co-author of more than 900 papers and presentations, 11 professional books, twenty patents, from what are applied partly in chemical process industries. He is member of several professional organizations as well as member of editor board of several professional journals.

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