DEVELOPING DEHYDROISOMERIZATION CATALYSTS FOR THE CONVERSION OF N-BUTANE TO ISOBUTENE ON THE BASIS OF ZSM5

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The activity and selectivity of Pt-ZSM5 catalysts with varying Si/Al-ratios for dehydroisomerization of n-butane was investigated. At 830 K isobutene yields of up to 13% were achieved. The reaction proceeds via a classical bifunctional mechanism. The conversion of n-butane and the yield of dehydrogenation products (butenes) mainly depend on the metal loading, while the ratio isobutene/butene only depends on the concentration of acid sites. The main route of byproduct formation is dimerization/cracking of butene over the acid sites. A high ratio of metal to acid sites is beneficial for the performance of the catalyst. Ion exchange with Na^+ can be used to adjust the acid site concentration of Pt-ZSM5. **Key words:** dehydroisomerization, n-butane, Pt-ZSM5, bifunctional catalysis

KINETIC STUDY ON IRANIAN PARAFFIN HYDROCRACKING

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As a first step towards the evaluation of an upgrading process for Iranian heavy feedstocks, catalytic hydrocracking of liquid paraffin hydrocarbons from Teheran refinery was studied using a pilot plant reactor. The experimental system consisted of a vertical tubular flow reactor where hydrogen and liquid products were fed from the top of the reactor and after passing through a bed of catalyst, the liquid and gaseous products were separated and sampled for subsequent analysis. For the purpose of kinetic modelling, a lumping scheme was employed in which the lumps consisted of the various boiling fractions. The predicted product distributions from the model were in good agreement with the experimental data. **Key words:** catalytic hydrocracking, Iranian paraffins, kinetic modelling

ACTIVITY OF NiMo/Y CATALYSTS PREPARED FROM DEALUMINATED Y ZEOLITES IN CONVERSION OF GAS OIL

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Activity of NiMo/Y catalysts based on thermally and chemically dealuminated Y zeolite was investigated. The zeolitic component of catalysts was characterised by FTIR spectra of structural OH groups, acidity by step wise TPDA of ammonia, Si/Al ratio in bulk was determined from chemical analysis and in the framework from IR skeletal vibration. Zeolitic components of the catalyst have similar framework composition and total acidity, differences were observed in the intensity of structural OH groups in FTIR spectra - from very high intensity in chemically dealuminated sample up to nearly disappearance of this bands in one of the thermally dealuminated sample indicating changes in the type of acid sites and, in acid sites strength distribution. With decreasing intensity of low an high frequency OH band in IR spectra increases the portion of acid site desorbing ammonia over 400 °C in sample, the initial conversion of n-hexane but also the rate of cooking. Hydrocracking of gas oil on NiMo/Y catalyst in pressure flow reactor after activation and activity stabilisation of the catalysts showed that on the catalyst based on thermally dealuminated Y samples at the similar conversion level of gas oil the concentration of liquid C5-9 fraction in cracking C1-9 light products is 1.8 times higher in comparison with catalyst based on chemically dealuminated ones. Results showed that acid sites type and strength play an important role on formation of gas /liquid cracking product in gas oil conversion and that the condition of dealumination significantly influenced the acid sites type and strength distribution in dealuminated zeolite. So the preparation method of Y zeolite dealumination had to be chosen in dependence on the desired performance of cracking catalysts. **Key words:** Y zeolite, dealumination, n-hexane, catalyst, gas oil

A STUDY OF COAL PARTICLE COMBUSTION

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Experimental and theoretical investigation of combustion of a single coal particle is presented. As model of char particle combustion the shell progressive mechanism was considered. The pore structure of an original, devolatilized and partially combusted particle was analyzed. Due to the bimodal character of the pore structure, the pore size distribution was determined by a sorption method and mercury porosimetry. Combustion experiments were carried out in an equipment by applying the TGA method. This equipment allowed to study the behaviour of the coal particle during the process of drying, degassing and combustion. During the combustion process, the particle appeared to consist of two regions - the noncombusted core and the ash layer. Time dependences of the particle mass, temperature in the particle and gas phase, and combustion products were measured. The obtained experimental results confirmed that the shell progressive mechanism can be applied for the mathematical description of combustion of a single coal particle. **Key words:** coal particle combustion, pore structure estimation, kinetic measurements, shell progressive model

HEXADECANE - ISOOCTANE COPYROLYSIS

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Mutual influence of 2,2,4-trimethylpentane (isooctane) and hexadecane has been studied during copyrolysis. Experiments with pure isooctane were carried out in identical conditions: temperatures from 700 °C to 780 °C, steam dilution (H_2O : HC = 3 : 1 wt.), atmospheric pressure. An accelerating effect of isooctane on hexadecane decomposition has been observed. Hexadecane decomposition in mixture was 1,7 to 1,9 times faster than during pure hexadecane pyrolysis. On the other hand hexadecane slowed down isooctane decomposition by 1,3 to 1,8 times. Pyrolysis of individual isooctane proceeds with the activation energy of 209 $kJmol^{-1}$ and during copyrolysis activation energy increases to 241 $kJmol^{-1}$. No essential change in the activation energy of hexadecane decomposition has been observed. During copyrolysis value of activation energy is 168 $kJmol^{-1}$. Methylpropene, propene, methane, hydrogen and isomeric heptenes have prevailed in the pyrolysis products formed by pure isooctane decomposition. 100 moles of reacted isooctane have produced only up to 12 moles of ethylene. The ratios between profiling products

considerably changed during copyrolysis. The amount of ethylene has greatly increased up to 145 moles/100 moles. The yields of propene and hydrogen have also increased. On the other side, the production of methylpropene with 1-butene have decreased. 1-Alkenes from pentene to pentadecene, formed by hexadecane decomposition, have been prevailing in the liquid pyrolysis products. Methane shows the most significant difference between its real yields and the yields calculated on the basis of its additive production. The production of methane has been higher than the additive one. Similarly the content of produced propene and methylpropene with 1-butene has been higher than the additive one. **Key words:** pyrolysis, isooctane, hexadecane, kinetics, copyrolysis

HYDROLYSIS OF AROMATIC HALOCOMPOUNDS CATALYSED BY ZEOLITES

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Liguid phase hydration of chlorobenzene, p-dichlorobenzene and o-,m-,p-chlorophenol over H-form mordenite and faujasite at temperature range from 150-215 °C in a batch system was studied. Influence of the type halocompounds and catalysts, reaction temperature, of the amount of methanol in the reaction mixture on the conversion of halocompounds and selectivity to products formation was determined. **Key words:** Hydrolysis, halocompounds, zeolites catalysts

LUBRICANTS BASED ON VEGETABLE OILS

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Vegetable oils represent easily biodegradable ester-type lubricants coming from renewable resources. Their importance from the environmental viewpoint is evident, especially in loss lubrication, hydraulic systems with increased risk of damage, etc. They are characterized by excellent lubricity, advantageous anticorrosive and temperature viscosity parameters. Some disadvantageous properties, particularly low thermal oxidation stability and worse cold flow behaviour, can be mitigated by structural modifications. In this study, possible substitutions of the alcohol part of triglycerides as well as changes in acyl unsaturated chains are shown. Attention is paid particularly to epoxidizing of double bonds in acyls resulting in the formation of oxirane rings. By opening them in the presence of hydrogen donors, it is possible to obtain new derivatives and polyfunctional compounds acceptable as environmentally friendly lubricants. **Key words:** lubricants, vegetable oils, ester oils, oleochemistry

EFFECT OF POLYMERS ON WAX PROPERTIES

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Role of polymers in modifying wax properties have been studied. On addition of polymers, such as polyethylene (PE) and ethylene vinyl acetate copolymer(EVA) in wax, drop melting point, kinematic viscosity at 100°C, and penetration of the wax and consequently flexibility and ardness which are indicators of performance in various applications of wax are significantly influenced. These studies clearly showed the potential of blending these polymers in modification of wax properties for meeting widely varying requirements. **Key words:** wax, polymers, wax/polymer blends

BIODEGRADATION OF VARIOUS ORGANIC SUBSTRATES WITH ACETOBACTER PASTEURIANUS CELLS

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Four bacterial strains Acetobacter pasteurianus genera were tested for the biodegradation of aliphatic and aromatic organic substrates. Acetobacter pasteurianus strains good utilised aromatic organic substrates as benzene, toluene, xylen, phenol and some of cyclic organic substrate as cyclohexan, cyclopentanol and cyclopentanon. **Key words:** Acetobacter pasteurianus, alkane, aromatic substrate, biodegradation, cyclic alkan, phenol

MODERN REFINING CONCEPTS "UPGRADING OF MIDDLE DISTILLATES"

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This paper provides an overview of the range of hydroprocessing applications especially for middle distillate range feedstocks, based on SÜD-CHEMIE's catalysts. Key processes are catalytic hydrodewaxing and dearomatization that are gaining increasing importance in terms of producing high quality diesel fuels and improving refining economics. SÜD-CHEMIE provides to the refining industry various hydroprocessing catalyst packages, including catalytic hydrodewaxing, dearomatization, deep desulphurization and MHC-catalysts. All these catalyst packages focus mainly on the economic benefits of implementing these catalysts into existing hydrotreating units. **Key words:** hydrotreating, HDS, gasoline, diesel, catalysts, dearomatization, dewaxing, mild hydrocrcking, hydroprocessing

UNDER-SIEVE FRACTION FROM BROWN COAL AND FLY ASH AS MATERIALS FOR REFINEMENT OF SEWAGE WATER

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The results from ion exchange on under-sieve fraction of brown industrial coal (Mine Dolina, Velky Krtis, Slovakia) and fly ash from brown coal burning (Electric Power Plant, Novaky, Slovakia) of salts ions (Zn^{2+}, Cd^{2+}, Cu^{2+}, Hg^{2+}, Pb^{2+}, Fe^{3+}, Ni^{2+}, Co^{2+}, Sr^{2+}, Cr^{3+}, Th^{4+}) in water solutions are presented. Besides of high ion exchange efficiency of the both materials, the under-sieve fraction is important for water refinement from organic impurities (toluene, chloroform, 2-propanol, acetone). Fly ash and particularly under-sieve fraction of brown coal containing humates of alkaline earth are applicable for "rough" refinement of sewage water as well as covering materials on barrier plastic or asphalt foils or safety barrier above non-barrier layer from calcium compounds. **Key words:** brown coal, fly ash, humic acid, refinement sewage water