SECTION D: PETROLEUM TECHNOLOGY AND MANAGEMENT

OD1. EXPERIMENTAL STUDY FOR OBTAINING QUENCH OIL FROM A RENEWABLE RESOURCE

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The exigencies concerning the quality of quench oils for thermal treatment of metallic parts were recently orientated towards the development of new materials focusing on costs mitigation and environmental protection [1]. Among other properties, the quench oils are characterized by relatively low viscosity, extremely low water content and high cooling rate [2].

The present work was dedicated to obtaining quench oil from rapeseed oil, through thermal cracking, at 300-375 ^{o}C, in advanced vacuum (10^{-3} mbar), and residence time between 2 and 20 min. Important yields of pyrolitic oil were obtained at 300-310^{o}C , between 61% and 87%.

Even though the viscosity of the raw oil diminished during the process by only 2-3.3 cSt measured at 100^{o}C, the cooling rate at 200-400-600^{o}C of the pyrolitic oil was much higher, even better than that of the usual commercial oil. This indicates that the heat transfer was favored by lower viscosity and recommends the pyrolitic oils for the rapid cooling (quench) of steel parts during their thermal treatment.

The Rockwell hardness tests on carbon-steel 25CD4 specimens proved that the pyrolytic oils obtained in this experiment are prone for use as quench oils, since the values of the hardness degree are close (43-45 HRC) to the commercial mineral oil (45 HRC).

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OD2. NEW TECHNOLOGY FOR ETHERS MANUFACTURING BY REACTIVE DISTILLATION PROCESS

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It is well known that ethers are components used in gasoline formulation to increase the performance of spark ignition engines by increasing the octane number and reducing the impact on the environment.

The reactive distillation is a process gaining ground in front of conventional synthesis methods.

Thus, an experimental study of *in situ* etherification of catalytic cracking light gasoline through a reactive distillation process was carried out.

The experimental laboratory plant consists in a fractionation column equipped with Rashig packing, and a catalyst layer interspersed in the packing. The catalyst is an acid-functionalized ion exchange resin, with sulfate ions (commercial name Purolite) which is commonly used as a catalyst at the synthesis of MTBE and TAME.

The aim of this study was to achieve *in situ* etherification of isoolefins and olefins from catalytic cracking light gasoline with different alcohols: methanol, ethanol, isopropanol and n-butanol, at temperatures in range of 60-70^{o}C, at atmospheric pressure, in a reactive distillation system.

Based on the chromatographic analysis of the etherification products corroborated with the mass balance of components, the conversions of the different olefins were calculated. From here, more detailed interpretations of the etherification results could be made.

Another important conclusion, based on the experimental data obtained in this work and in previous works, was that a process of increasing the octane number of petrol can be developed by *in situ* etherification of isoolefins and olefins in the reactive distillation system.

PD1. HYDROCONVERSION OF PYROLYTIC BIO-OIL OVER Cu/Mo CATALYST

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Conversion of pyrolytic oil into deoxygenated liquid fuels is made in order to obtain biofuels components and green bitumen solvents. These processes are dependent on the nature of the catalyst tested and the reaction conditions. Therefore, the deoxygenating process is accompanied by other secondary reactions such as hydroisomerization, dehydrogenation and cyclization, which occur simultaneously [1]. The hydroconversion study was carried out on pyrolytic bio-oil obtained by pyrolysis of the digestate conditioned with lipid fraction. The granular Cu-Mo/gama alumina catalyst was prepared by impregnating with an aqueous solution of copper nitrate and ammonium molybdate using the pore filling method. The catalyst was characterized by textural analysis and acidity measurements. The textural characteristics of the catalysts tested were: specific surface area, pore volume, average pore diameter, pore size distribution. The specific surface area was calculated using the BET equation in the linear part of the adsorption isotherm. For evaluation of pore distribution and pore size, the hysteresis isotherms desorption branch was applied using the BJH method. The acidity measurements were done by thermodesorption of diethylamine. Experiments were carried out on a laboratory equipment in continuous system using a fixed bed catalytic reactor at 275-325°C, pressure from 10 bar to 40 bar and the liquid hourly space velocity from 0.8 h^{-1} to 1.5 h^{-1}. The main compounds resulting from the process are hydrocarbons and oxygenated compounds.

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PD2. THE FIRST STEP OF BIOETHANOL PRODUCTION - EXTRACTION YIELD OF CELLULOSE FROM SOFTWOOD SAWDUST

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Current trends are to reduce the use of fossil fuels and their impact on the environment and to obtain energy from solar, wind and biofuels. Because in nature there are huge quantities of lignocellulosic materials, biofuels, especially bioethanol, could be produced by utilizing lignocellulosic biomass. Therefore, the first step to be taken into account for obtaining bioethanol is the processing of lignocellulosic biomass by various pretreatment methods: physico-chemical, mechanical or biological.

The purpose of this work was to extract the cellulose fraction from lignocellulosic biomass (softwood sawdust) by physical-chemical pretreatment. The sawdust of different granulosity was pretreated acid and alkaline using different concentrations of sulfuric acid, respectively sodium hydroxide. In this study, the temperature, the solid-liquid ratio and the cellulose extraction time were also taken into consideration. This step is very important because it has as main purpose the removal of lignin but also of the other components existing in lignocellulosic biomass.

After the application of the two pretreatments (acid and alkaline), higher yields in cellulose were obtained for the alkaline pretreatment. Some of the components released after the two pretreatments were analyzed by spectrophotometric and HPLC methods.

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PD3. BIOPENTANOL, A POSSIBLE FUEL FOR TRANSPORTATION DOMAINE

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The growing demand for transport fuels in correlation with the need for environmental protection has led to the trend of diversification of biofuels used as fuels for internal combustion engines. The introduction of new biofuels on the transport fuels market requires a detailed knowledge of both the properties of new biofuel and the properties of their blends with conventional fuels.

Biopentanol can become a candidate either as an additive or as a substitute of conventional fuels. In order that blends of conventional fuels with 1-pentanol to be used in the field of transportation, their properties must be known, respectively how the addition of pentanol influences the properties of the basic fuel. One of the properties that influence both the combustion process from diesel engine, but also transport and storage operation, is density. The aim of this study is to report density data for diesel fuel+1-pentanol and biodiesel+1-pentanol blends over the entire composition domain and for temperature ranging from 20 ºC to 40 ºC and to evaluate the accuracy of different models to predict these blends properties.

The decrease of the density of the blends with the increase of the alcohol content was observed both for the blends of pentanol with diesel fuel and biodiesel. It was noted that the dependence of density on the composition of the blends is not linear. Such behavior is usually typical to systems characterized by differences in the chemical structure of the components. The density decrease with the increase of temperature was observed for the two studied blends. The prediction of the density of the blends with 1-pentanol have quite small values of the absolute and relative error when using Kay rule. However, a third degree polynomial equation has a slightly higher accuracy in density estimation. On the other hand, Kay rule is easier to be used because its application only requires knowing the density of the pure components of the pseudo-binary blends of fuels.