Evaluation of Biofuel Derived from Lignocellulosic Biomass Fast Pyrolysis Bio-Oil for Use as Gasoline Addictive

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Introduction

Energy demand is increasing rapidly due to population growth and its technological expectations. The world population is devoted to the industries of coal and petroleum derivatives, but with the unbridled exploitation of natural reserves and the issue of global warming, there is currently great interest for sustainable energy production. The renewable energy sources such as biomass have a critical role in the energy context, environmental and socio-economic development. Biomass consists of elements like carbon, hydrogen, oxygen and nitrogen. The sulphur is present in smaller proportions and some types of biomass also contain significant portions of inorganic species. Sources of biomass include wood and wood waste, agricultural crops and residues, municipal solid waste, animal waste, food processing waste and aquatic plants and algae. The main molecular constituents of biomass are hemicellulose, cellulose and lignin.

One of the main processes of thermal conversion of lignocellulosic biomass is the fast pyrolysis. Agricultural waste such as straw, sugar cane, corn stover, grass, rice straw, bark and several others, are placed in a sort of loop, where they burn so fast that vaporize. Most of the steam, then condensed, is bio-oil, which contains virtually all substances in the biomass needed, but in a liquid state. Several mechanisms have been proposed for the possible routes of reaction that occur during pyrolysis of biomass. Acetic acid is the main product of thermal decomposition. During pyrolysis, the formation of water by dehydration of acetic acid by the removal of acetyl groups originally linked to units of xylose, furfural by dehydration of xylose, formic acid from the carboxylic groups of uronic acid and methanol from methoxyl groups of uronic acid also. In generally, the fast pyrolysis process produces liquid fuels with high yield; however, there are still some challenges to be faced in the use of these products. The oil produced by pyrolysis of biomass, generally called bio-oil, and is a renewable liquid fuel, which is a major advantage over petroleum, can be used for the production of numerous chemical substances.

The use of bio-derived oil as fuel for transport is technically possible, but there is a need for research and investments. Research involving separation and processing of components of bio-oil esters, is to characterize the reactions and pyrolysis products, evaluating product stability during storage or test the mixture of biofuel be blended with petroleum diesel or gasoline are being held in order to verify the stability of the product during storage or evaluate their performance and usability can be blended with fossil fuel. The oxygenated compounds of bio-oil, originating from the pyrolysis of biomass has the potential to form blends with fossil fuels used in transport vehicles.

We obtained esters derived from bio-oil to form stable emulsions with gasoline sold in Brazil and assess their possible use in vehicle (Guedes *et al*., 2010). This biofuel was evaluated in combination with the type C common gasoline sold in the city of Campinas in São Paulo state and the city of Londrina in Parana state through testing in Otto cycle engines.

Results and Conclusions

From the pyrolysis process technology (Bioware) using lignocellulosic biomass (bagasse and straw, sugar cane and grass) was produced bio-oil as a raw material used in this study. The product of the Fischer esterification on the aqueous fraction (pH = 2) bio-oil (67.5% of C_3-C_8 aliphatic and aromatic ethers, aldehydes, ketones and phenols), was treated to reduce concentrations of water and mixed with gasoline type C marketed in the cities of Campinas and Londrina, PR in the proportions of 2, 5, 10 and 20% v/v forming stable emulsions.

According to the results of physic chemical established by the ANP, biofuel showed characteristics similar to ethanol and in some cases, better performance due to their chemical characteristics. There was a significant increase in the octane number (MON) and antiknock index (AKI) in commercial gasoline containing ethanol. Every 2% by volume of biocombustible added there was an increase of 0.5 in the MON octane of the gasoline. The distillation curves of petrol containing 2, 5, 10 and 20% biofuel parameters were within specification limits, including with respect to the generation of waste. The results of tests to verify the induction period and confirmed the formation of gum commercial fuel specification with the addition of biofuel.

Proven its technical feasibility, the possibility of biofuel use would incorporate them into standard gasoline through a mixture with anhydrous ethanol fuel amounting to 25% in fossil fuel, according to the legislation for adding alcohol to gasoline business.

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