

TITLE: *Physical-chemical evaluation of bio-oil and bio-fuel as additive for fossil fuel.*

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ABSTRACT

In the last century, crude oil by-product fuels were the main sources of energy in the world. Considerable effort has been directed in the development of processes for production of alternative liquid fuels. The use of the biomass as potential source of automotive fuels, of chemical products and of materials gave a new impulse to the practice of the pyrolysis in the last decades. The liquid resulting from the process of pyrolysis of the biomass has been designated as bio-oil. The bio-oil a complex mixture of alcohols, aldehydes, cetones and carboxyls acids among other, presents as characteristic the low stability, caused by the reactivity of the compounds contained in the oil. The present work had as objective monitors the viscosity of the bio-oil in 2, 5, 10, 15 and 20% (v/v) of ethanol during period of 15, 30, 45, and 60 days of stored at room temperature (22oC). Another objective has been to evaluate the possibility of use of the bio-fuel, obtained through the esterification process (acid catalysis in ethanol) of the most acid fraction (pH=2) of the bio-oil, in mixture or as additive to the main automotive fossil fuels (diesel and gasoline) marketed in Brazil. The variation in the viscosity in the bio-oil and in the bio-oil/ethanol was verified and it showed more accentuated in the bio-oil with 5% of ethanol, which favored the polymerization reactions, oxidation and other chemical reactions and physical processes, denominated aging of the oil. It was observed that the better concentration for storage of the bio-oil was in 10 and 15% of ethanol, because the increase of viscosity of the oil during the period and in the monitoring conditions it was more discreet. The bio-fuel, bio-oil by-product, properly treated by distillation was added in the proportions of 2, 5, 10 and 20% (v/v) to Gasoline Type C and Diesel marketed in Campinas and Londrina cities. The mixture of the bio-fuel with the gasoline constituted stable emulsions; however, the addition of the bio-fuel to the commercial diesel was not favorable even with the use of surfactants. In agreement with the physical-chemical rehearsals accomplished in the Gasoline Type C with addition of the bio-oil, the fossil fuel maintains inside of specifications of the Petroleum National Agency in Brazil, except in the trial for verification of the alcoholic content. In spite of a small alteration in the profile of the distillation curve of some samples, all the temperatures and percentages of evaporated fuel stayed inside of the limits of the Brazilian legislation. It was

verified increase in the octane number of the gasoline in mixture with the bio-fuel, without increasing the generation of residues. The trials for determination of the specific mass, steam pressure and tenor of sulfur did not indicate variation to influence in the quality of the Gasoline Type C. The results of the rehearsals to verify the gum formation, induction period and corrosiveness to the copper in the gasoline with addition of the bio-fuel were same those found in the Gasoline Type C. The alcoholic tenor determined for the Gasoline Type C in mixture with the bio-fuel, indicated a greater alcohol percentage than that previously added by the dealers, due to limitations in the determination of the volume of polar groups contained in the bio-fuel.