OPTIMIZING ESTERIFICATION AND VISCOSITY OF VEGETABLE OILS EXTRACTED FROM FOUR SOURCES

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Abstract

Depletion of fossil fuels warrants the use of biofuels as an alternate source to minimize the usage of petroleum reserves. Biodiesel fuels are renewable source of energy derived from plant oils or animal fats. They are mono alkyl esters of long chain fatty acids formed by transesterification of oils/fats. Biodiesel can be used neat or blended with diesel as engine fuel. Efficiency of transesterification of oils from four sources (cottonseed, safflower, castor, used cottonseed oil) was determined in this study with both methanol and ethanol as alcohols and sodium hydroxide and potassium hydroxide as catalysts. Methanol was found to be a better solvent and sodium hydroxide a better catalyst based on this study. In our experiments, cottonseed oil esters had viscosity lesser than castor oil esters but twice that of safflower oil esters. It is known and validated in this study that the high viscosity of vegetable oil can be reduced by transesterification with alcohols. Blending the methyl and ethyl esters of oil with No. 2 diesel provided reduced viscosity as a fuel. The viscosity increased in a non-linear fashion as the percentage of castor esters increased in castor esters diesel blends and in castor esters safflower esters blends. Only slight increases in viscosity were observed in B40 and B60 mixtures with No. 2 diesel. Limited viscosity reduction was seen with ten chemical additives in castor esters at the rate of 0.01%, 0.1% and 1.0%.