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Blends of babassu, palm kernel and coconut fame with fossil kerosene: Technical aspects of low carbon number methyl esters as a possible source for renewable jet fuel

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Abstract

Three different oils: babassu, coconut and palm kernel have been transesterified with methanol by the homogeneous basic catalysis method obtaining good yields. After the alcoholysis the fatty acid methyl esters (FAME) have been subjected to vacuum fractional distillation, and the low boiling point fractions have been blended with two types of fossil kerosene, a straight-run atmospheric distillation cut (hydrotreated) and a commercial Jet A1. The blends of FAME and Jet A1 at three different proportions: 5, 10 and 20% vol. meet some of the specifications, depending on the FAME content, such as: density, lubricity, smoke point and flash point, although none of them, but the babassu sample, meet the lower calorific value by a very narrow margin, less than 1.0 MJ kg^{-1}, when blended with 5% FAME. Oxygenated fuels are proved to decrease the emission regarding global warming such as: soot and CO_2. On the other hand, these fuels present problems regarding their stability and may damage the elastomer materials that are mainly in the joints. In our work, we show the results of tests ran under stress conditions with 5 different elastomer materials and the one used in the aircraft's seals. From an industrial perspective we present on this work a simulation ran in Pro 2, which suggest that eight to nine stages are needed for the vacuum distillation of the FAME.

Biography

Alberto Llamas is an assistant lecturer at the Madrid Polytechnic University. He is currently finishing his PhD Thesis on biodiesel production and biodiesel combustion. He has recently published three papers on the subject of FAME as renewable jet fuel.