Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2016, 8(8):36-38
(http://derpharmachemica.com/archive.html)

Comparing the density of the oils: Plant (Lio, Sunflower, Neem, Nigel) and diesel

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ABSTRACT

The density is an important feature, especially for biofuels, as it determines the design and technological features of feeders (pumps, injectors); more on a system installed, use of widely different density of biofuels would result in combustion setting changes with implications for maximum power, efficiency and emissions of pollutant. In our study, we report measurements of the density of vegetable oils (Lio, Sunflower, Neem, Nigel) and diesel fuel depending on the temperature. These measurements were made between 10°C and 85°C. These measurements show that the neem oil decreases very remarkable as compared to other oils as the temperature increases.

Key words: Density, Lio, Sunflower, Neem, Nigella, Diesel, Temperature.

INTRODUCTION

Vegetable oils, naturally rich in fatty acids and vitamins, play an important role in our diet especially against the aging of our cells.. Vitamin A and E, polyphenols, which act as powerful antioxidants as well as vitamin E, phytosterols whose structure is close to the cholesterol and prevent the formation of the (bad) cholesterol and other precious substances such as fatty acids, first cold pressed oils are the concentrated goodness. In the refined oils, in addition to traces of chemicals used, many components are denatured or destroyed by the extreme heating.

Some plant oils have similar electrical and thermal properties, or better than current liquid dielectric with superior environmental performance. In transformers, a stable liquid, inert, having good electrical and thermal properties is required, outside, fluid should be non-toxic to the environment and readily biodegradable. The intrinsic properties of natural vegetable oils, in terms of fire resistance, environmental performance, electrical and thermal characteristics and dielectric compositions are particularly useful products in the field of electrical engineering. [1]

The concept of green chemistry [2] was established to "support the design of products and processes that reduce or eliminate the use and formation of hazardous substances." These eco-design rules sometimes seem binding but they can become profitable, especially for chemists and manufacturers. Green chemistry principles tend towards more environmentally friendly methods of synthesis and use of renewable raw materials [3].

The use of vegetable oils in tractors was not optimal when the engine was hot. This is due to an index cetane lower than that of diesel and a viscosity more important. Research has shown that these esterification of vegetable oils increases the cetane number and bring it closer to that of diesel. [4]

Vegetable oils are generally very low toxicity and have excellent biodegradability. These qualities are due in particular to a low resistance to oxidation and hydrolysis. These two characteristics, which are favorable to the eco-toxicological aspects [5].

MATERIALS AND METHODS

Density measurement

The meters are cylindrical glass tubes, hollow, graduated, weighted with lead shot, immersed in liquids. They penetrate vertically, more or less deeply, depending on the strength (from top to bottom due to its weight, and from the bottom upwards due to buoyancy) which oppose each other. The weight of the displaced fluid is equal to the volume of the displaced liquid (submerged volume of the hydrometer) that multiple density of the liquid. When the camera is stabilized, the reading is done according to the scale at the point of outcrop. The submerged volume of the hydrometer varies inversely with the density of the liquid in which it is immersed: the higher the density, the lower the hydrometer sinks.

Figure 1: standard hydrometer glass weighted with lead.

Measuring the density of the vegetable oils

The measurement technique varies depending on the required measuring accuracy. Routine measurements are performed usually with a glass hydrometer standard weighted with lead. The hydrometer is immersed in the liquid previously placed in a test tube. Pressing in the fluid varies with its density whose value is directly obtained through a graduated scale. Density of the standards used to verify the calibration of hydrometer.

For a more precise measurement, we use a pycnometer. This small container whose shape is reminiscent of the vial, is characterized by a very precise volume. The determination of the density is carried out by weighing. It is imperative to keep the same pycnometer to measure the mass of water and mass of substance. It is also preferable to degas the solutions by placing the pycnometer in a vacuum chamber.

Automatic density meters are available and allow to have density measurements accurate to +/- 0.001 g/mL. The liquid is placed in an oscillating tube. The period of vibration is proportional to the density of the liquid.

The container used for measuring the density of liquids is called "pycnometer".

RESULTS

We studied the density variation in viscosity versus temperature vegetable oils: Lio, sunflower, neem, nigel and diesel, the results obtained are shown in figure 2.

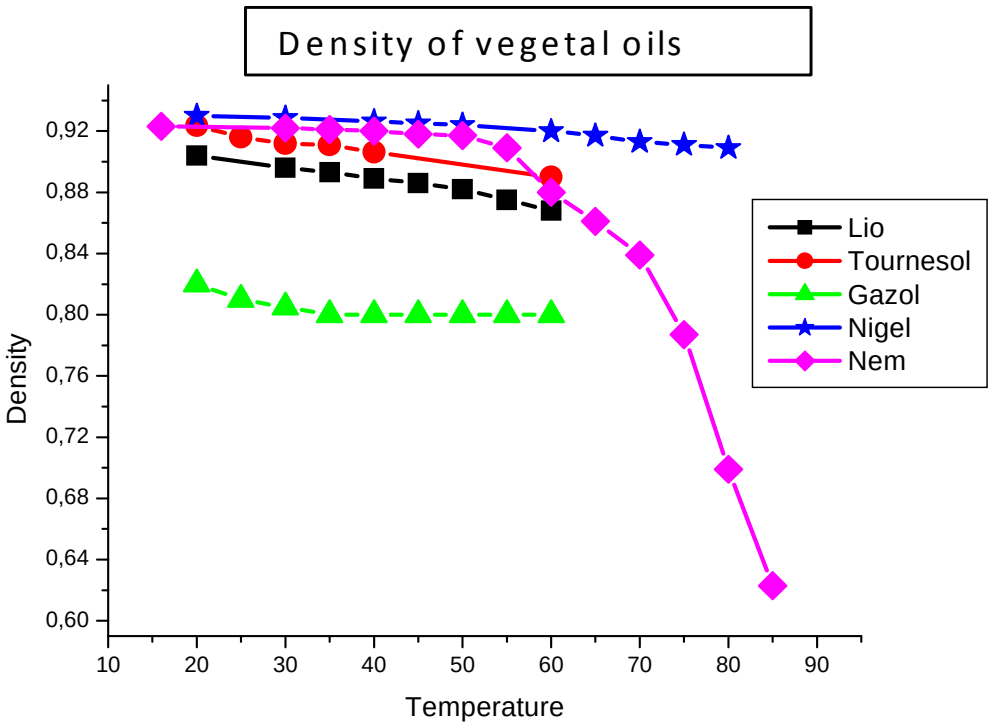

Figure 2: Density of vegetable oils and diesel fuel as a function of temperature

The density varies with the pressure and temperature. Note that the density of the oil closely follow, uncross with temperature.

Oils densities that decrease is observed with increasing temperature, we can explain this decline:
• The various chemical changes experienced by the oil upon heating.
• The orientation of the molecules, as the temperature increases, which promotes the passage of current in the oil.

CONCLUSION

The study of the density of the Lio oils, sunflower, neem, nigel and diesel, can be useful for application in echnology (insulation, transformer.). This study allowed us to compare our results on the behavior of the density depending on the temperature with those of other researchers working on the same research topic.

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