Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2016, 8(4):414-417
(http://derpharmachemica.com/archive.html)

Study of the resistivity and viscosity of vegetable oils Argan, Olive, Avocado, Colsa, Tournosol

Taoufik Dahass[1], Oumaima Dahass[1], Hajar Saaid[1], Merieme Raqba[1], Maryem Belgharza[1] and Mohamed Alaoui El Belghiti[1]

[1]Laboratoire de Chimie Physique Générale, Département de Chimie, Université Mohammed V, Faculté des Sciences, Avenue Ibn Batouta, BP 1014 Rabat
[2]Laboratory Materials, Nanotechnology and the Environment (LMNE), Department of Chemistry, Université Mohammed V-Agdal, Faculty of Sciences, Ibn Battuta Avenue, PO Box 1014 Rabat
[3]Chemistry Laboratory at the Agronomic and Veterinary Institute Hassan II, Madinat Al Irfane, BP 6202. Rabat – Morocco

---

ABSTRACT

Some vegetable oils have electrical and thermal properties similar or better than those of current dielectric fluids with superior environmental performance. The intrinsic properties of natural vegetable oils in terms of fire resistance, environmental performance and electrical and thermal characteristics, dielectric compositions are particularly useful products in the field of electrical engineering. In this work, we report measurements of the viscosity and resistivity of the oils Argan, Olive, Avocado, Canola and Sunflower. These measurements show that viscosity and resistivity decreases when the temperature believed. This decrease was attributed to the effect of the thermal agitation of molecules on the structure of these oils.

Keywords: viscosity, resistivity, vegetable oil, transformer dielectric

---

INTRODUCTION

The concept of green chemistry [1-2] was created to "support the design of products and processes that reduce or eliminate the use and formation of hazardous substances." These rules ecode sign sometimes seem restrictive, but they can become profitable, especially for chemists and manufacturers. The principles of green chemistry tend to more environmentally friendly methods of synthesis of the environment and the use of renewable raw materials [3]. Because of their chemical inertness when subjected to electric fields, oils are often used as insulation for some electrical applications, including transformers, circuit breakers, cables and capacitors.

There are prototypes of biodegradable insulating oil for electrical transformers based on derivatives of vegetable oils (fatty acids) and with unmatched performance at low temperatures. Biodegradability and non-toxicity of these insulating oils are substitutes choice for those customarily used are all based petrochemical derivatives and therefore more prone to price fluctuations of petroleum products [4]

MATERIALS AND METHODS

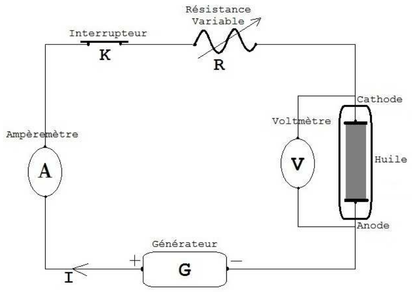
Vegetable oils are generally very low toxicity and have excellent biodegradability. These features are due in particular to a low resistance to oxidation and hydrolysis. These two characteristics that are favorable to eco-toxicological aspects, plant oils are already used in distribution transformers and attempts are underway to extend their use in power transformers. [5].

Vegetable oils commercially available were purchased on the market.

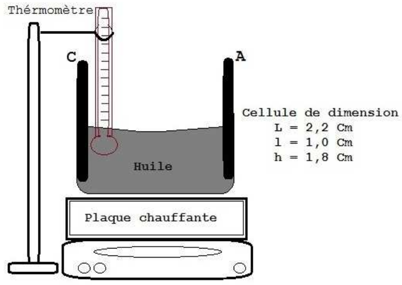
1.1.**Materials:**

- **Diagram of the cell used to measure the electrical resistivity.**

We used the method of resistivity measurement called "colon": the electrical resistance of the oil is determined by measuring the current and the potential difference (ddp) between the two electrodes of the cell.



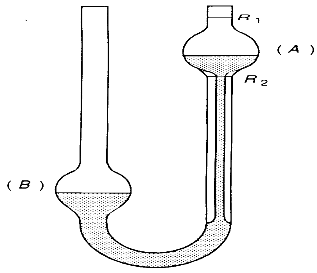
a. Construction of the used apparatus.



b. measuring cell resistivity.

***Diagram of the cell used to measure the viscosity**

The viscosity is measured by a viscometer Osswald:



Viscometer Osswald

Methods for measuring the kinematic viscosity of vegetable oils:

Measurement of the flow time of a volume V of fluid through a capillary tube. The kinematic

$$\nu = K \cdot \Delta t$$

Viscosity is proportional to the flow time:

The constant K of the apparatus is given by the manufacturer of the viscometer.

RESULTS

We studied the variation of resistivity and kinematic viscosity with temperature vegetable oils: Argan, Olive, Avocado, rapeseed, sunflower results obtained are shown in Figure 1 and Figure 2.

Figure 1 below shows the change in the electrical resistivity of vegetable oils as a function of temperature. We note that all oils have the same behavior of the resistivity except for the case of avocado oil for which there is a slight difference.

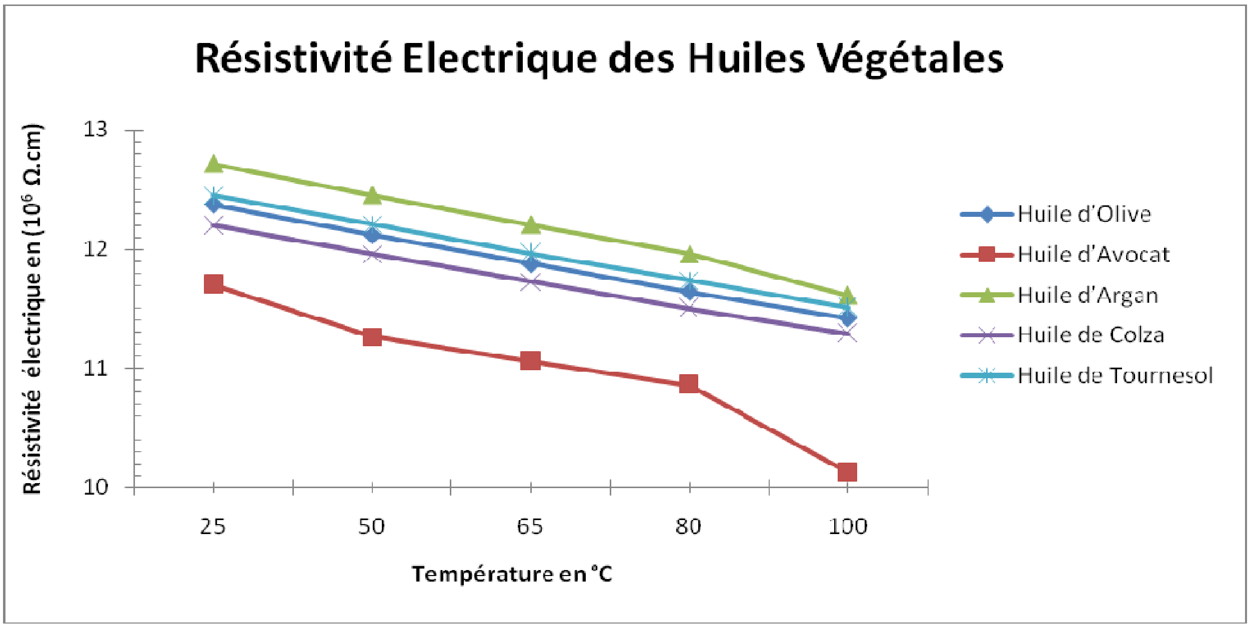


Figure 1 Electrical Resistivity of Vegetable oils

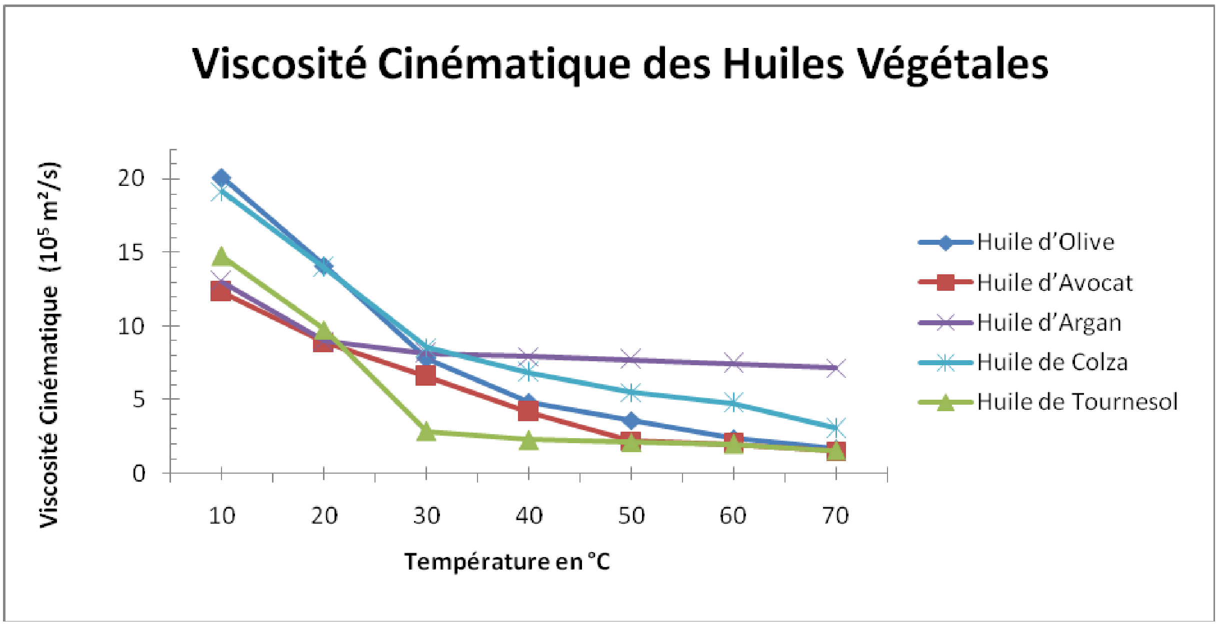


Figure 2: Kinematic Viscosity of Vegetable Oils

In the figure 2 we observed that the viscosity decreases with increasing temperature, can explain this decrease:
• For the various chemical changes undergone by the oil upon heating.
• For the orientation of the molecules, as the temperature increases (decrease in viscosity with increasing temperature) which promotes the flow of current in the oil.
• The dependence of the viscosity of the fluid temperature is an expression of its behavior and thermal energy of cohesion, with a temperature rise, the polar attraction between molecules decreased while their thermal energies and increased viscosity oil decreased.

Our measurements are consistent with measures Dilip Kumar [6] because the estimated coefficient by the author is very small so we can neglect it. The viscosity measurement is a method for the quality control of oil and as an indicator of changes in the new oil or in service resulting from contamination or damage.

CONCLUSION

We can conclude that the temperature facilitates when it increases, the viscosity and resistivity of the oils we studied. This study allowed us to compare our results on the behavior of the viscosity and resistivity as a function of temperature with those of other researchers working on the same research topic [7-8].

The study of the viscosity and resistivity of these oils may beings useful for application in technology (insulation, transformer...)

RÉFÉRENCES

[1] Bozell J.J., Patel M.K., Feedstocks for the Future – Renewable for the Production of Chemicals and Materials, Edition American Chemical Society, **2006**.
[2] Anastas P.T., Warner J.C., Green chemistry theory and practice, Edition Oxford University press, **1998**.
[3] Baumann H., Bühler M., Fochem H., Hirsinger F., Zoebelein H., Falbe J., *Angew. Chem. Int. Ed. Eng*., **1988**, 27, 41-62.
[4] Vitilingon G. et al. (**1998**) *Industrial Crops and Products* 7 (**1998**) 273-279
[5] A. Darwin, C. Perrier and P. Foliot, "The use of natural ester fluids in transformer", Proceedings of MATPOST conference, Lyon (France), Paper 0036,November 15-16, **2007**.
[6] Dilip Kumar, Amarjit Singh, Paramjit Singh Tarsikka, *journal of food science technologique* DOI 10.1007/s13197-011-0346-8.
[7] Pace WE, Westphal WB, Goldbith SA (**1968**) *J Food Sci* 33:30-36.
[8] Risman PO, Bengtsson NE (**1971**) *J Microwave Power* 6:101-106