ID: 5032

Observing the Depollution of Used Oil via Viscosity Changes Utilizing Algerian Clay

Abdelhak Serouri[1*], Zoubida Taleb[1] and Safia Taleb[1]

[1] Laboratory of Materials & Catalysis, Faculty of Exact Sciences, Djillali Liabès University, Sidi Bel Abbès Algeria

*Corresponding author's email: serouriabdelhak@gmail.com

ABSTRACT

In recent times, the global escalation of pollution has become notably pronounced, with human activities being the principal contributor to this environmental predicament. Among the various sources of pollution, waste oils, particularly from food, have emerged as a significant concern. Directly disposing of these oils exacerbates environmental issues, yet an alternative approach involves recycling them, presenting a cost-effective and eco-friendly solution. This study addresses the mitigation of pollution caused by used oils, exploring a treatment technique involving the adsorption of used oil onto Algerian clay. The investigation is centered on key parameters such as density, conductivity, and pH. Algerian clay, subjected to X-ray diffraction (DRX) analysis both before and after the adsorption of waste frying oils, exhibited discernible alterations in the DRX spectrum peaks. This indicates a compositional change in the clay, reinforcing its efficacy as a potent adsorbent. Viscosity, a crucial parameter for oil quality, was examined before and after treatment with varying stirring times. The findings unequivocally demonstrate the effectiveness of Algerian clay in treating used food oil. This research not only underscores the potential of clay as an efficient adsorbent but also contributes to the broader discourse on sustainable waste management practices.

Keywords: viscosity; pollution; recycling; DRX; used oil.

1 Introduction

In order to comply with the international targets of sustainability and CO2 emission, it is pivotal to apply circular economy models to the development of new processes and to the reconversion of existing ones (Corona et *al.* 2019; Rodriguez-Anton et *al.* 2019). In a global context marked by an alarming intensification of pollution, the ecological footprint of human activity appears to be the main catalyst for this worrying phenomenon. Among the many sources of pollution, oil waste, particularly food waste, stands out as a major concern. The common practice of direct disposal of these oils compounds environmental problems, while the prospect of recycling offers an economical and environmentally friendly solution. From the processing of used vegetable oils treatment it is possible to obtain many chemicals with applications in cosmetics (Biermann et *al.* 2011) or biodiesel (No et *al.* 2011). This study focuses on the mitigation of pollution caused by used oils, exploring a treatment technique by adsorption on Algerian clay. There are several methods of recycling its oils in particular: the recycling of oils using Algerian clays: calcium and sodium (Serouri et *al.* 2021). Key parameters such as density, conductivity and pH are the focus of this investigation, providing insights into the effectiveness of Algerian clay as a powerful adsorbent. This research is not limited to demonstrating the effectiveness of clay, but also contributes to the broader dialogue on sustainable waste management practices.

2 Experimental

Elio frying oil used 10 times. Its composition: 100% soya oil, food additive: antioxidant SIN306 (extract rich in tocophenols 100% Natural). Sodium clay were brought from ENOF in the region of Maghnia in Western Algeria. The FTIR spectra were obtained by PerkinElmer Model Frontier/Multi scope spectrophotometer with spectral range of 4000 to 400 cm−1 and 2 cm−1 resolution. For physical parameters, a calorimeter DR/890 to measure turbidity, pH meter Inolab for pH measurement and a

DOI: 10.21467/abstracts.170 ISBN: 978-81-970666-1-0 (eBook)

conductimeter : WTW cond 7110 (Conductivity, Salinity, TDS). The density is calculated using this law: and Where d is oil density, m (g) is the mass of oil, υ (mL) is the volume of oil and ϱ (g/mL) is the volumic mass.

3 Results and Discussion:

3.1 Physico-chemical analyses of oils before and after treatment:

The Table 1 shows the results of all the frying oil before and after treatment onto sodium clay. It is noted that the pH of the oil treated onto sodium clay during 2 h treatment became 6.68 and after 4 h the pH of the oil treated decreases to 2.39 which means the decrease of the acidity. The conductivity of the new oil and the WCO is 0.1 it is seen that it increases to 1.7 after treatment of 2 h and in treatment for 4 h the conductivity is 0.9, so the concentration of ions increases in the oil treated due to its agitation with the clay. The salinity measurements show that there are no dissolved salts in all the oil samples as regards the TDS increases during 2 h and 4 h treatment of different value which proves the presence of other dissolved matter. The turbidity value has decreased in treated oils 37 and 14 UTN but the value after 4 h agitation is closer to the initial value than that of new oil, the density of used oil after treatment of 2 h, it is noted that the density of WCO increases to 0.9215 and after treatment of 4 h also increased to 0.9224 both values are close to the density value of the new oil, which ensures that the treatment worked more or less well on the WCO.

Table(1): *Physico-chemical parameters on a new, used and processed frying oil*

	pH at 22°C	σ ( ) 16.9°C	Salinity	TDS	Turbidity (UTN)	Density
New Oil	5.507	0.1	0	0	0	0.938
WCO	5.104	0.1	0	0	69	0.9048
Treated Oil (2h)	6.68	1.7	0	2	37	0.9215
Treated Oil (4h)	2.39	0.9	0	1	14	0.9224

4 Conclusion

The global concern over pollution arises from its severe impact on human, animal, and plant health, as well as the environment, leading to systemic modifications. Often originating from chemical or biological sources, such as waste oils, these pollutants, resistant to oxidation and biodegradation, pose a lasting threat persisting for centuries. Our study focused on evaluating the potential of sodium clay to mitigate pollution from Waste Cooking Oils (WCO) and repurpose them into fuels or cleaning and cosmetic products. Physico-chemical analyses of new oil, WCO, and clay-treated WCO after stirring for 2 and 4 hours demonstrated the notable effectiveness of sodium clay in this regard.

References:

[1] Corona, B.; Shen, L.; Reike, D.; Rosales Carreón, J.; Worrell, E.(2019) Towards sustainable development through the circular economy— A review and critical assessment on current circularity metrics. Resour. Conserv. Recycl. 151, 104498.

[2] Biermann, U.; Meier, M.A.R.; Metzger, J.O.; Schafer, H.J.(2011) Oils and fats as renewable raw materials in chemistry. Angew. Chem. Int. Ed. 50, 3854

[3] No, S.Y.(2011) Inedible vegetable oils and their derivatives for alternative diesel fuels in CI engines: A review. Renew. Sust. Energy Rev. 15, 131–149.

[4] Serouri,A ;Taleb,Z ;Mannu,A ;Garroni ,S ;Senes,N ;Taleb,S ;Brini,S and Abdoun,k (2021). Variation of Used Vegetable Oils' Composition upon Treatment with Algerian Clays, Recycling,6,68.

ISBN: 978-81-970666-1-0

Series: AIJR Abstracts

DOI: 10.21467/abstracts.170