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## BACKGROUND

### BIODIESEL

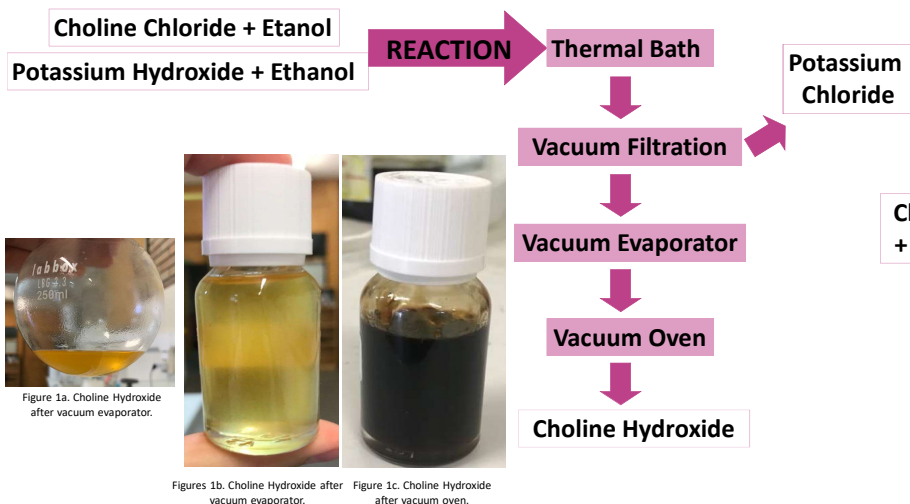
Biodiesel is a mixture of alkyl esters derived from vegetable oils or animal fat, formed by triglycerides that can be converted into biofuels by different forms, being transesterification the most common used method. In the transesterification process, the most used alcohol is methanol and the byproduct of this reaction is glycerol.

### IONIC LIQUIDS

The use of ionic liquids (ILs) in catalytic processes has been studied mainly in the ecological field, as it allows a high recycling efficiency. Choline cation-based IL (2-hydroxyethyl trimethylammonium) has been studied mainly for its biocompatibility characteristic and potential for various industrial applications, mainly choline hydroxide (ChOH) which shows good catalytic performance due to its basicity in methanol solution as well as its successful reuse.

## METHODOLOGY

### Choline Hydroxide Synthesis



Figures 1b. Choline Hydroxide after vacuum evaporator.

Figure 1c. Choline Hydroxide after vacuum oven.

### Biodiesel Synthesis

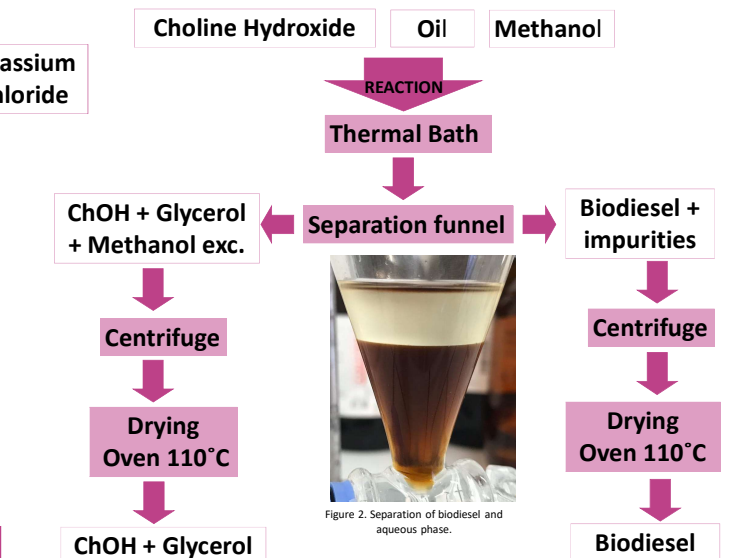


Figure 2. Separation of biodiesel and aqueous phase.

## EXPERIMENTAL RESULTS

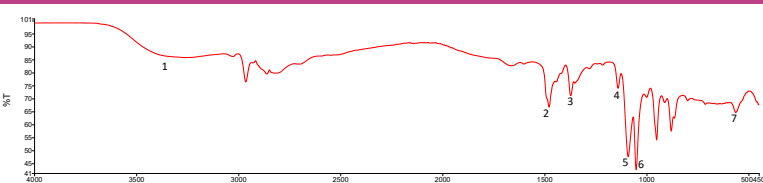


Figure 5. FTIR of synthesized Choline Hydroxide.

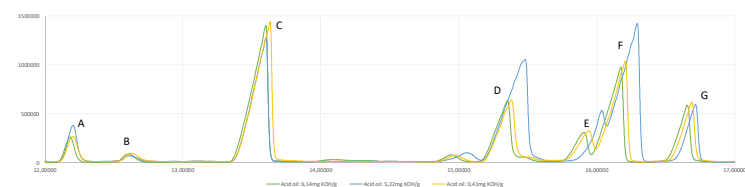


Figure 6. Chromatograms of biodiesel obtained with oils with different acidities.

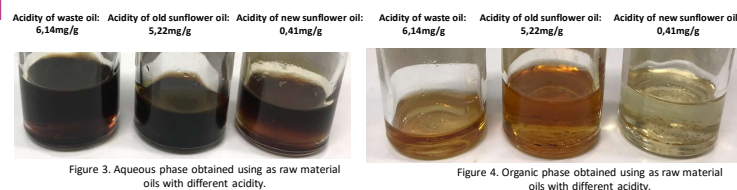


Figure 3. Aqueous phase obtained using as raw material oils with different acidity.

Figure 4. Organic phase obtained using as raw material oils with different acidity.

Table 1. Reaction conditions of Biodiesel.

Time	4h
Temperature	60°C
oil/methanol	1:10
% of catalyst	10%

Table 2. Esters characterization of biodiesel samples from GC-FID analysis.

Reference	Compound Name	Structure	37 FAME MIX	Acid Oil	Acid Oil	Acid Oil
				6,14mg KOH/g	5,22mg KOH/g	0,41mg KOH/g
Time (min)						
A	Palmitic acid methyl ester	C16:0	12,172	12,181	12,181	12,202
B	Palmitoleic acid methyl ester	C16:1	12,514	12,605	12,605	12,629
C	Heptadecanoic acid methyl ester	C17:0	13,413	13,587	13,600	13,630
D	Stearic acid methyl ester	C18:0	14,872	14,945	14,939	14,970
E	Oleic acid methyl ester, Elaidic acid methyl ester	C18:1 (c+t)	15,232	15,365	15,351	15,380
F	Linoleic acid methyl ester, Linolelaidic acid methyl ester	C18:2 (c+t)	15,987	15,905	15,907	15,943
G	Gamma-Linolenic acid methyl ester	C18:3n6	16,521	16,662	16,654	16,687

## CONCLUSIONS

In this work, ChOH was synthesized and characterized by FTIR showing the characteristic bands: 1, representing the OH (hydroxyl) group, bands 2 and 3, groups -CH<sub>2</sub> and -CH<sub>3</sub>, bands 4, 5 and 6, amines and band 7, Cl<sup>-</sup> (chloride). Used as catalyst in the production of biodiesel, the preliminary results using the reaction conditions from Table 1 and a waste cooking oil (acid oil: 0,41 mgKOH/g) sample and two types of sunflower oil (acid oil: 6,41mgKOH/g and 5,22mgKOH/g), exhibited the occurrence of the transesterification reaction with the synthesis of fatty acid methyl esters (FAME), which was confirmed by Gas Chromatography (GC-FID) as can be seen in Table 2.

## REFERENCES

- [1] X. Lang, A.K. Dalai, N.N. Bakhshi, M.J. Reany, P.B. Hertz, Preparation and characterization of bio-diesels from various bio-oils. *Bioresource Technology*, 80, pp. 53-62, 2001.
- [2] J.D. Rocha, Use of Ionic Liquides in Biodiesel Productions – a review. *Brazilian J. Chem. Eng.*, 29(1), pp. 1-13, 2012.