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STUDYING THE INFLUENCE OF CELLULOSE TRINITRATE IN THE MODIFICATION OF PROPERTIES OF UNLEADED GASOLINE CO 95 AND VISUALIZING ITS INTERNAL STRUCTURE

DORDEA Traian[1], TUDOR Camil[1] & STĂNIA Lucian[1]

[1]Constanta "Ovidius" University, Faculty of Mechanical, Industrial and Maritime Engineering, 132, Mamaia Street, 900721, Constanta, Romania, e-mail address:traiandordea@yahoo.com

Abstract: Celluloses as a part of biomass can be considered a source of cheap, renewal energy that can be transformed in energy directly through ignition or incorporating it is an usual fuel.
Key words: nitrate celluloses, gasoline, microscopy.

1. INTRODUCTION

The paperwork has as main objective studying the internal structure of celluloses nitrate and researching its influence in modifying a fuel octane number.
For lab determinations, it has been used the following devices:
- Spectrometer IROX 2000 (fig. 1.) to analyze the chemical ingredients of fuels using Fourier transform on the field 2,7 – 15,4 μ.
- optical microscope BioROM-T, to get images 4x, 10x, and 16x;

Figure 1 Analyzer IROX *2000*

- microscope with electron scanning CM 120 kV produced by Phillips (Figure 2.).

Figure 2 Microscope CM 120

2. MATERIALS AND METHODS

In order to get the fuel mixture cellulose nitrate – premium fuel CO 95,

2.1 Sample 1

- it has been weighed 10g of nitrate cellulose with a nitration degree of approximately 14% that has later on dissolved in 100g. methanol with 95% concentration.

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- from the previous mixture, it has been extracted like 5g solution dissolved in 10g. bioethanol;
- this solution was mixed with 100g. CO 95 fuel.
- The mixture was not unitary, after its settling, it was filtered.

2.2 Sample 2:

- it has been weighed 10g of nitrate cellulose with a nitration degree of approximately 14% which has later on been dissolved in 100g. methanol with 95% tested fuels;
- from the mixture, it has been taken 5g. solution that was dissolved in 10g. methanol;
- this mixture was blended with 100 ml CO 95 fuel.

Comparing the two samples, there was the following conclusion: the first one made up of CO 95 fuel and 10% bioethanol and the second one contained only CO 95 fuel.

The fuel mixtures were prepared in gravimetric ratios from one reference batch of fuels and alcohols.

3. LAB DETERMINATIONS

The samples were analysed with the help of the fuel analyser IROX 2000 and the results are presented in Table 1

Parameter	Gasoline CO 95	Gasoline + 10% bioethanol	Gasoline + nitrate cellulose + bioethanol	Gasoline + nitrate cellulose + methanol
Density [g / cm^3]	0,749	0,754	0,758	0,761
Methanol [% vol]	-	-	7,5 % gr.	11,9 % gr.
Ethanol [% vol]	3,6	13,7	4,0	2,8
MTBE [% vol]	-	-	-	-
ETBE [% vol]	5,8	4,9	5,2	5,2
TAME [% vol]	3,1	2,8	2,3	2,6
DIPE [% vol]	-	-	-	-
Benzen [% vol]	0,65	0,56	0,71	0,60
Toluen [% vol]	6,2	4,9	4,9	5,2
m Xilen [% vol]	5,7	4,2	4,6	4,4
θ Xilen [% vol]	2,0	1,3	1,4	1,7
p Xilen [% vol]	2,5	2,0	2,2	2,0
Oxygen [% vol]	0	0	0	0
Aromatics [% vol]	36,7	33,8	33,5	33,3
Olefins [% vol]	5,9	1,3	4,5	2,8
Saturates [% vol]	44,5	43,5	43,3	41,8
COM [% vol]	85,1	84,6	84,8	85,2
COR [% vol]	96,1	98,3	95,7	95,9
FBP [^{0}C]	180,4	169,8	193	198,8
P_{vap} [KPa]	67,6	74,6	47,5	42,3

Table 1. Relative presentation of main parameters of the tested fuels

4. OPTICAL MICROSCOPY

In order to get images, we used an optical microscope BioROM-T, with objectives of x4, x10, x16. The images were recorded with a CCD color video camera Ikegami ICD-504P model, with a zoom capacity of 3,2x connected to the application Analysis 2.1 through a frame grabber.

The images were expanded in ImageJ, as reference.

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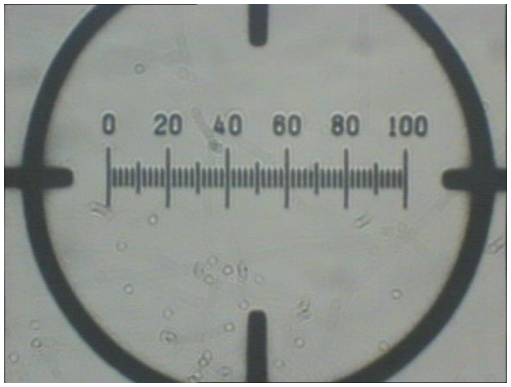

Figure 3 Grid to determine

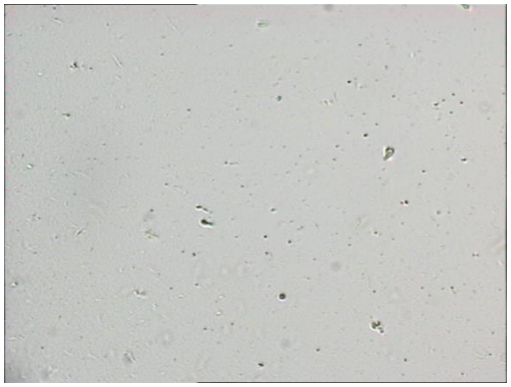

Figure 4 Celluloses trinitrate
with an increasing factor of 4x

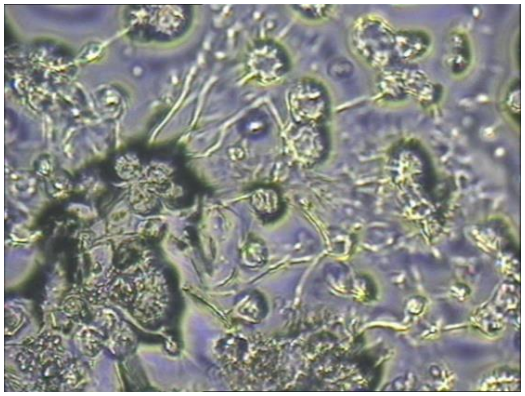

Figure 5 Cellulosis trinitrate,
with an increasing factor of 10x

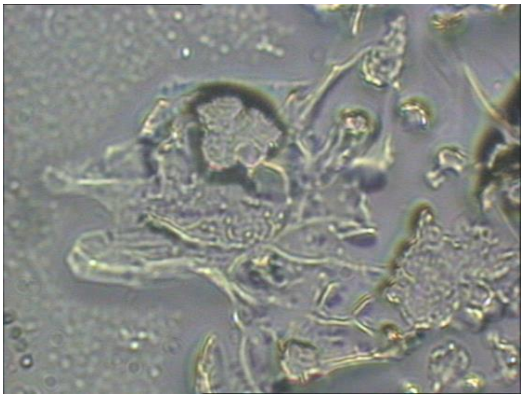

Figure 6 Cellulosis trinitrate
with an increasing factor of 16x

5. ELECTRONIC MICROSCOPY

It has been done with the support of CM 120 which is a microscope, capable to scan by releasing electron beam with a maximum of 120 kV produced by Phillips company (Figure 2).

- *Preparing samples for analyzing*:

- It is released in absolute alcohol
- Ultrasounding for 30 minutes
- A tiny drop is put on the grid covered in formvar
- It is waited the evaporation of alcohol or it is put in vacuum for 1 hour.

Optionally (it is indicated several times) the sample can be cleaned with the help of a plasma cleaner.

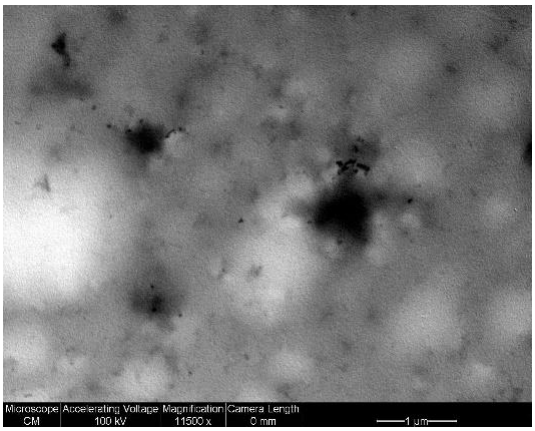

Figure 7 Internal structure of trinitrate cellulose
with an increasing factor of 11.500X

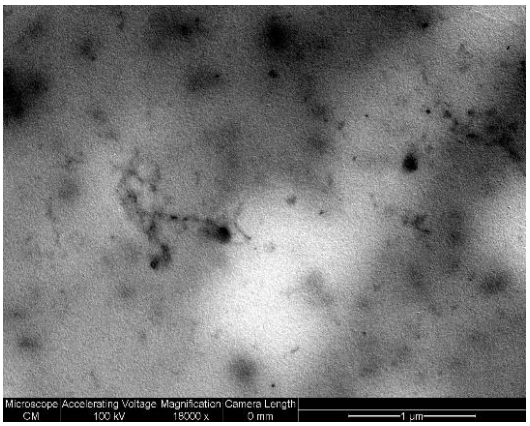

Figure 8 Cellulosis fibers, dimension between 5-6
nm. factor of increasing 11.500X

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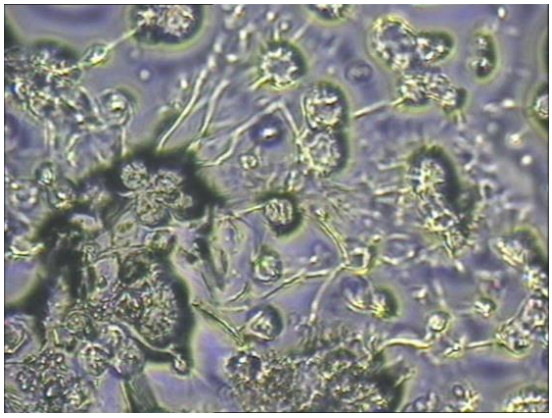

Figure 9 Molecule of trinitrate cellulose, with an increasing factor of 87.000X

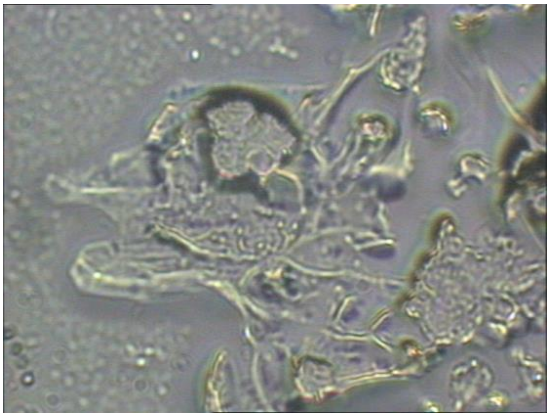

Figure10 Molecule of trinitrate cellulose with an increasing factor of 180.000X

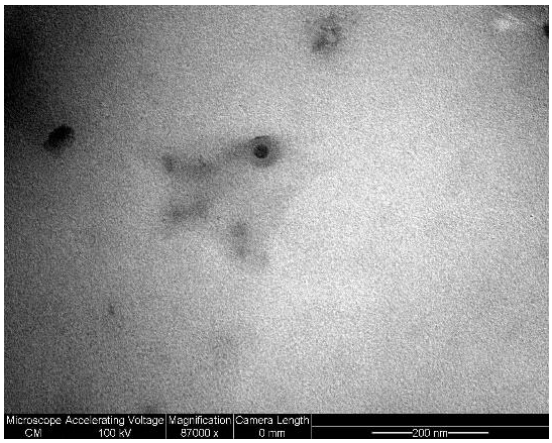

Figure 11 Carbonate atom with an increasing factor of 87.000X

Figure12. Atomic levels of celluloses trinitrate with an increasing factor of 880.000.000X

6. CONCLUSIONS

Testing the samples previously presented allowed the conclusion that the trinitrate cellulose can be used as additive to improve energetic properties of fuels although in the data base of analyzer IROX 2000 there are no references for celluloses and nitrate fuels.

It is interesting that it is used an explosive for increasing the octane number of a fuel, defined as the resistance at self-ignition, resistance to detonation.

The usefullness of celluloses as trinitrate to modify the octane number of fuels for spark ignition engines represents something new and it takes studying influences and its impact in the engines operation.

7. REFERENCES

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