Sensor For Determining The Composition Of Fluid

Gennadij Lukyanov, Ilya Kovalskiy
ITMO University
Saint-Petersburg, Russia
gen-lukjanow@yandex.ru,

Vladimir Margolin
Saint Petersburg Electrotechnical University "LETI"
Saint-Petersburg, Russia
v.margolin@mail.ru

***Abstract*—Sensor is designed to determine the liquid composition. Tests were conducted on various samples are shown the results of experiments on the sample of vegetable oils and mineral waters. There have been good results in the future the method will be improved, for a more precise determination of the composition of the liquid.**

I. Introduction

Determination of the composition of the substance usually occurs using the following basic methods: spectroscopic, diffraction, optic. All these methods are based on determining the changes in radiation, field or particle flux after interaction with matter, with a large set of physical properties.

All of these methods have sufficiently accurate determination of the composition substances, but in the real industry is not always required an exact determination of the composition, for example, in the oil industry should be conducted rapid tests to determine the type of oil or water utilities need to control the level of emissions of harmful substances by various companies. But the solutions to these problems, by existing methods are not cost-effective and therefore require the development of new methods and techniques to determine the change in the composition of substances.

II. Method

In particular, to solve these problems, have been suggested a method of determining the composition and / or by measuring the dynamic changes electro physical characteristics and their subsequent treatment.

As objects of study in the early stages of work were selected different samples of sunflower oil and water, and it is no coincidence, because the plant oils are major source of energy for humans, and water is an essential substance for all living beings on the planet, and used in many manufacturing processes.

Formed research program is aimed to define such characteristics for liquids that could make it possible to link the electrical properties of liquids with a concentration of the individual components. Only in this case the data may be used to form an adequate information model.

III. Results

In this research program to study the electrical properties of plant oils should position sunflower oil as initial research object, because the composition of the main components of plant oil - oleinic acid (C18: 1) and linoleic acid (C18: 2) varies over the entire range of concentration values taking place separately for each of a plurality of other vegetable oils.

In accordance with the research plan for measuring dynamic electrical properties of oils and other liquids laboratory setup was created. It allows to study changes in the numerical values of electro physical parameters depending on the concentration of the individual components of vegetable oils.

As the objects of the study were selected three sample of refined sunflower oil having a fatty acid composition specified in table 1. Determination of the fatty acid composition was performed on BRUKER «Scion 436-GC» capillary gas-liquid chromatograph using a Bruker «Wax-fame» capillary column.

TABLE I. Fatty acid composition of samples of refined sunflower oil

Name fatty acid	Reference-designation	Relative concentration(%)		
		Sample№1	Sample№2	Sample№3
Palmitinic	C 16:0	5,9	6,4	4,0
Stearinic	C 18:0	3,4	3,1	2,6
Oleinic	C 18:1	23,7	31,4	81,6
Linolic	C 18:2	66,3	58,1	11,6
Arachic	C 20:0	-	-	0,2
Behenic	C 22:0	0,7	1,0	0,1

For each sample of sunflower oil were obtained values of output level changes in time at the measuring cell. Fig. 1 clearly shows that functions have characteristic maximum rate of changing the output level of the values of the measuring cell. The character of the data obtained for three different samples of sunflower oil, confirms the presence of proportional growth rate of its value changes in process of increase concentration of oleic acid in the samples. Thus, during the studies were obtained numerical values of electro physical parameters.

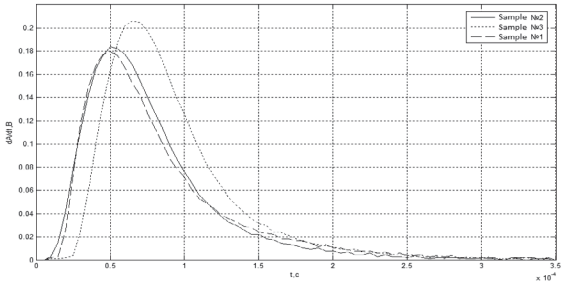

Fig. 1. The dependence of the rate of change of the output signal from the measuring cell time for various samples of sunflower oil

The relationship between the concentration of the main component plant oils - oleinic acid and electro physical parameters of sunflower oil in the analytical laboratory unit cell has been discovered. It can be concluded that the possibility of creating express-method for determining compliance with the standards of the quality requirements of sunflower oil based on the detected patterns.

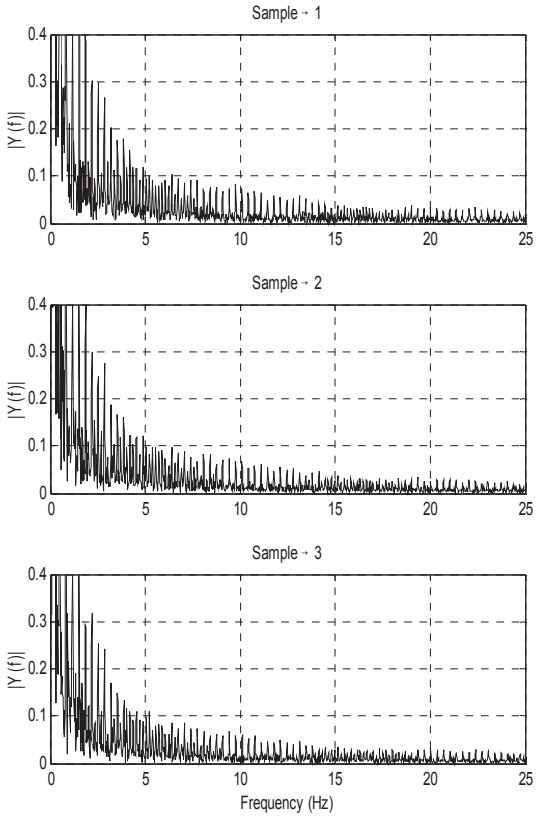

Fig 2. Examples of sensor output spectra for different water samples

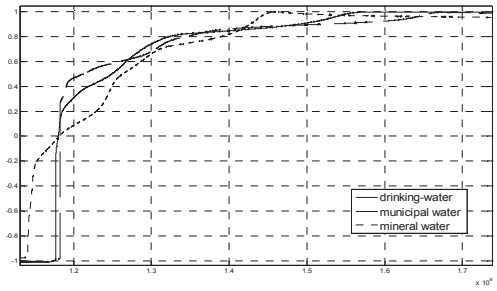

Fig 3. The output signal from the measuring cell for various water samples

Also a series of experiments with water, in particular with different kinds of mineral water, was conducted. Examples of sensor response on a few of them are below at Fig.2. Fig. 3 shows parts of the spectra of data signals obtained Fourier transform.

IV. Conclusion

In the primary analysis for the outlined output signal curves of various samples of water and vegetable oil it can be concluded about the possibility of creating on the basis of the detected patterns of rapid method for determining the change in the composition of substances. At this stage it is already possible to use this sensor to determine the correspondence between the reference and test samples. Further it is planned to go to the liquid composition exact definition through the spectrum analysis of output sensor signal and different mathematical methods using.

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