the method of electric explosion of wires (EEW). In this paper the properties of a tantalum nanowire in an argon and helium medium was studied.

The operational principle of a device is shown at [2]. During the experiment a tantalum wire with a diameter of 0.2 mm was used. The total capacitance of the capacitor bank was 0.75 μF which was charged to an initial voltage level of 25 kV. The length of the exploding conductor was 70 mm; all experiments were carried out in argon and helium at a pressure of 2 atm. For obtaining powders, an explosion mode was used with a specific level of input energy into the conductor (0.74 es).

Figure 1 demonstrates photographs of powder particles and their particle size distribution in an argon atmosphere. Particles have a spherical shape, the main size is 20–50 nm, the maximum distribution is 10–20 nm.

Figure 2 shows the photograph of particles which was obtained in an argon atmosphere. According to a transmission electron microscope and a histogram of the particle size distribution, the particle diameter is 50–80 nm, the maximum distribution is 20–40 nm.

Therefore, replacement of the inert atmosphere of helium to argon is the reason of an increase in the particles' diameter of tantalum nanopowder at the same explosion parameters.

References

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THE CHOICE OF OPTIMAL PARAMETERS FOR THE BIODIESEL SYNTHESIS

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Biodiesel fuel (BioDF) is a renewable resource characterized by environmental friendliness and safety in operation. BioDF is a mixture of monoalkyl fatty acid esters obtained from triglycerides by transesterification (esterification) reaction with monohydric alcohols [1].

Sunflower edible unrefined oil was selected as the feedstock for BioDF synthesis, and ethanol was used as the transesterifying agent. An alkaline cata-

Table 1. Varying the BioDF synthesis parameters

№	Variable parameter	Catalyst weight, % by weight of oil	Synthesis time, h	Oil : alcohol ratio	Temperature, °C
1	Catalyst concentration	1.0	1.0	1 : 6	45
2		**0.5**	**1.0**	**1 : 6**	**45**
3		2.0	1.0	1 : 6	45
4	Synthesis time	2.0	0.5	1 : 6	45
5		2,0	2.0	1 : 6	45
6	Oil: alcohol ratio	**2.0**	**1.0**	**1 : 3**	**45**
7		2.0	1.0	1 : 9	45
8		2.0	1.0	1 : 12	45
9	Temperature	2.0	1.0	1 : 6	30
10		2.0	1.0	1 : 6	60

Table 2. Physicochemical characteristics and yield of obtained BioDF

№	Yield, % wt.	Viscosity				Density at 15 °C, kg/m³
		20 °C		40 °C		
		μ, mPa • s	ν, mm²/s	μ, mPa • s	ν, mm²/s	
1	69.17	20.61	22.68	10.81	12.08	911.50
2	A small amount of product was obtained					
3	87.82	22.66	24.78	11.11	12.36	917.00
4	49.88	22.71	24.94	10.99	12.27	910.70
5	60.73	17.66	19.34	9.34	10.42	917.20
6	A small amount of product was obtained					
7	41.50	10.83	12.11	6.32	7.13	895.70
8	35.86	6.35	7.22	3.84	4.44	882.70
9	44.74	7.28	8.26	4.35	5.02	885.50
10	43.37	26.68	29.30	14.26	15.90	914.40

lyst (NaOH) was used to accelerate the transesterification reaction and increase the yield of fatty acid ethyl esters.

The aim of this work is to conduct BioDF synthesis from sunflower oil with varying parameters (catalyst concentration, synthesis time, molar ratio of vegetable oil: alcohol, temperature) with the subsequent choice of the most optimal BioDF synthesis parameters from the viewpoint of product yield and their physicochemical characteristics.

The variation of the synthesis parameters was carried out in accordance with Table 1.

For the products obtained under the conditions presented in Table 1, the yield, density at 15 °C, dynamic (μ) and kinematic (ν) viscosity at 20 and 40 °C were determined.

The results of determining these characteristics are shown in Table 2.

When setting synthesis parameters №2 and 6, it was not possible to allocate a sufficient BioDF amount to evaluate the yield and physicochemical characteristics.

As can be seen from Table 2, the best (smallest) BioDF physicochemical characteristics were obtained during synthesis №8 (catalyst weight – 2 % by weight of oil; synthesis time – 1.0 hour; oil : ethanol ratio – 1 : 12; temperature – 45 °C), but for this synthesis there is a low yield of the product (35.86 % wt.), which is not economically profitable when using this BioDF as a blend component for diesel fuel.

From this view point the most suitable conditions for synthesis are №3 (catalyst weight – 2 % by weight of oil; synthesis time – 1.0 hour; oil : ethanol ratio – 1 : 6; temperature – 45 °C), where the product yield was 87.82 % wt. Based on the obtained data, it can be concluded that the optimal synthesis conditions should be selected based on the required parameters of the final product (qualitative or quantitative characteristics).

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