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PROPERTIES OF TANTALUM POWDERS IN ARGON AND HELIUM ATMOSPHERES

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Tantalum is one of the widespread metals in manufacturing of solid-state capacitors which have high permittivity, therefore it can accumulate a large supply of energy [1]. With the growing requirements for reliability and the minimum size of electronic devices, the study of this metal in these niches is still continued, as well as ways of development of it such as the main component.

Several methods of obtaining tantalum nanopowders are known in the world, and one of them is

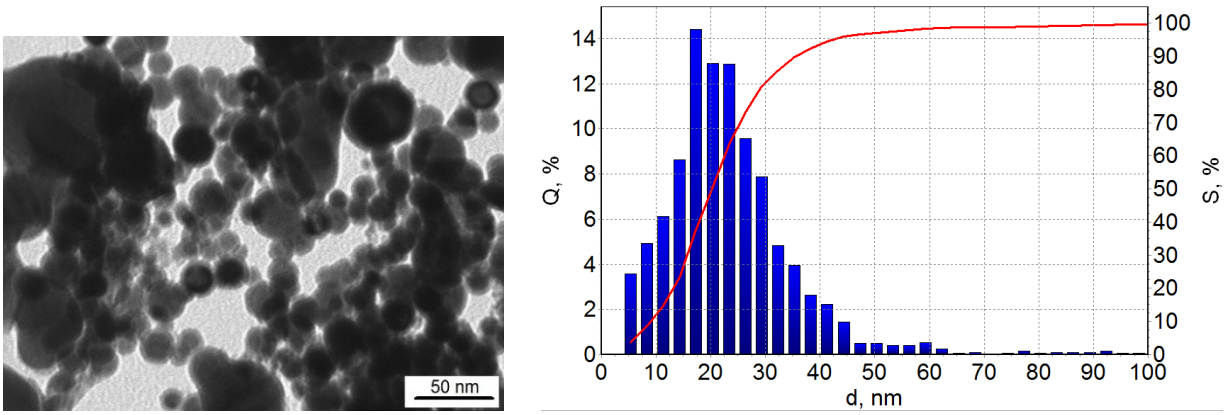

Fig. 1. *The photograph of powder particles obtained in a helium atmosphere, the histogram of particle size distribution*

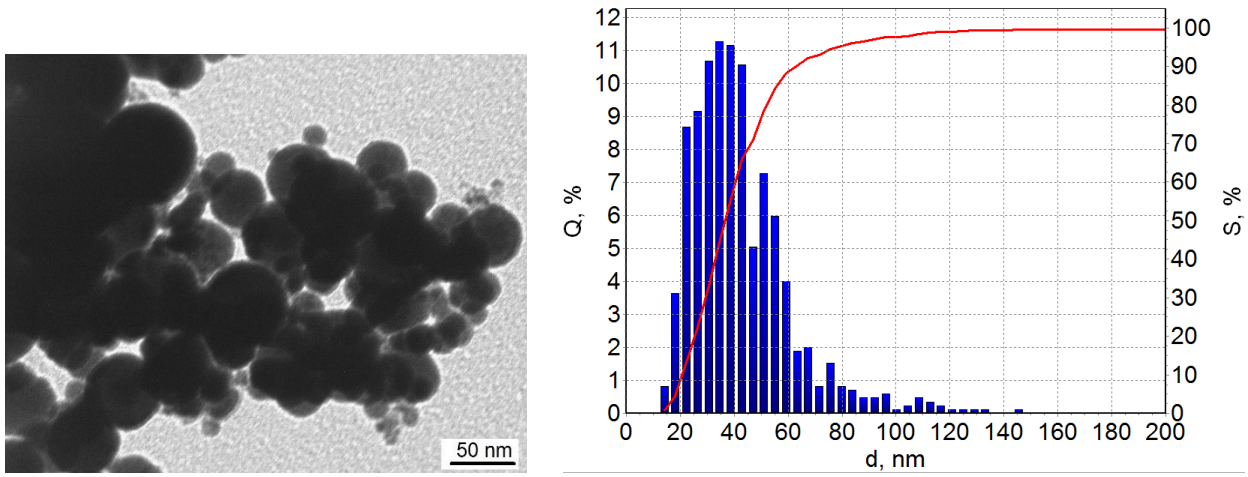

Fig. 2. *The photograph of powder particles obtained in argon atmosphere, the histogram of particle size distribution*

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.

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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