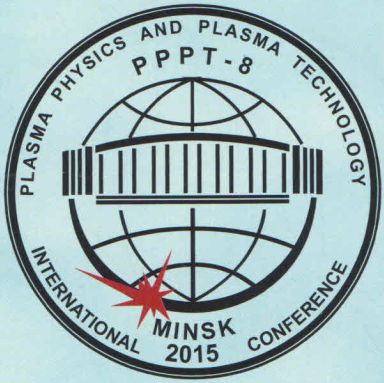

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THE METHOD FOR SYNTHESIS OF SMALL DISPERSE PARTICLES IN COMBINED ARC AND RF DISCHARGES

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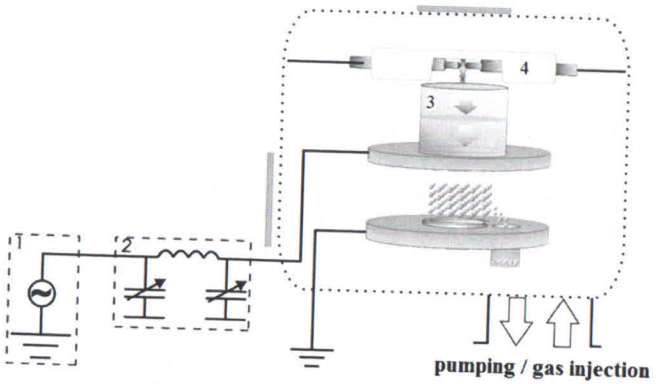
Introduction

The technology of monodisperse nano- and micropowder synthesis is mostly a laborious and long process, and sometimes unjustifiably energy-intensive process. Because of this, today in the world market the prime cost of monodisperse nano- and micropowders is very high, ~ 100-500 USD per 10 gram. Therefore the new methods and technologies of separation and synthesis are needed to reduce the cost of such particles.

Experiment

In this work a new method of synthesis of small dispersed particles in the plasma of combined discharge is presented. The scheme of experimental setup of combined arc and rf discharge is shown on figure 1. The presented method is based on two parallel processes – synthesis of polydisperse particles in arc discharge and extraction of small disperse particles from dust structure in the plasma of radio-frequency (rf) discharge.



1 – RF generator, 2 – matching box, 3 – trap with sieve, 4 – arc electrodes

Fig.1. Experimental setup of combined arc and rf discharges

The following parameters were used for obtaining small disperse graphite microparticles: W_{rf} = 1,5W, p_{Ar} = $7 \cdot 10^{-2}$Torr; U_{DC} = 30V, I_{DC} = 25A. The material of arc electrodes is graphite.

Results

The morphology and chemical composition of synthesized microparticles by DC arc discharges are shown on figure 2. The average size of synthesized microparticles is 60-80 μm (figure 3).

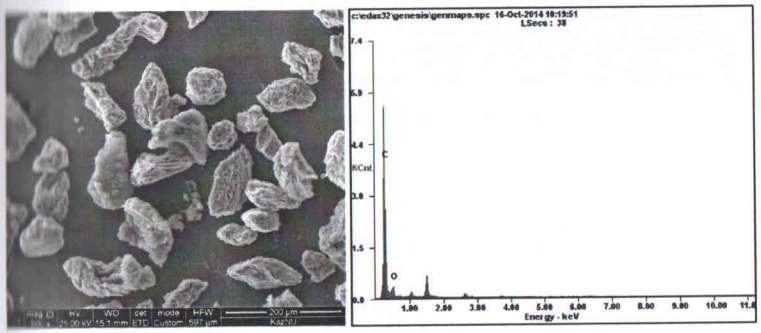


Fig. 2. Synthesized polydisperse microparticles in DC arc discharge and their chemical composition

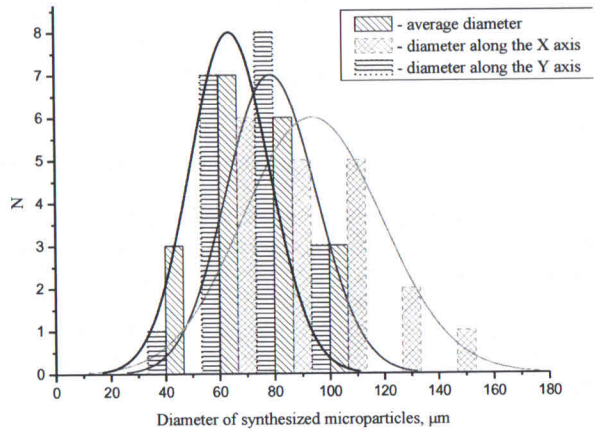


Fig. 3. Histogram of synthesized polydisperse microparticles

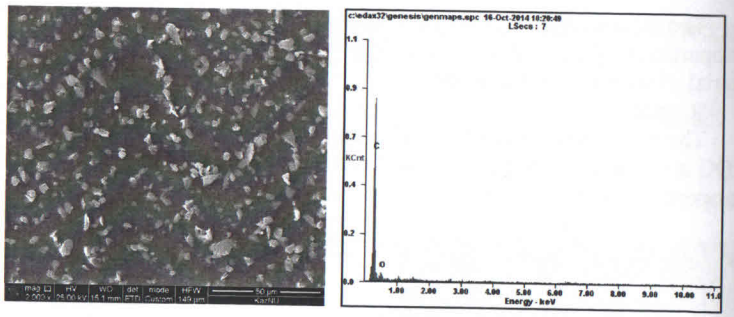


Fig. 4. Obtained small disperse microparticles after extraction process

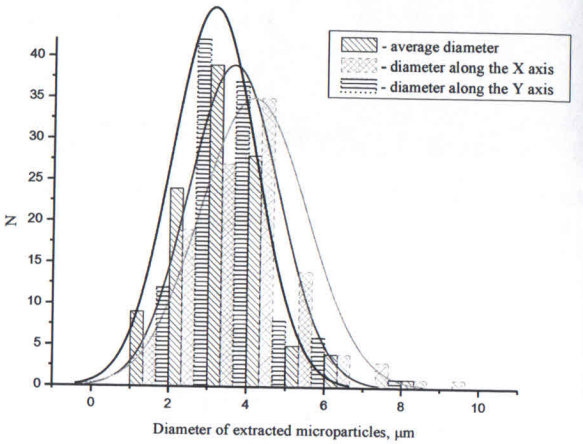


Fig. 5. Histogram of extracted small disperse microparticles

The technology of extraction of small disperse microparticles is well described in /1-3/. The morphology, chemical composition and size distribution of extracted small disperse microparticles are shown on figures 4-5. The average size of obtained small disperse particles is 4 μm.

The advantage of proposed method is the simplicity of technology for obtaining small dispersed microparticles of different materials, including their composites.

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