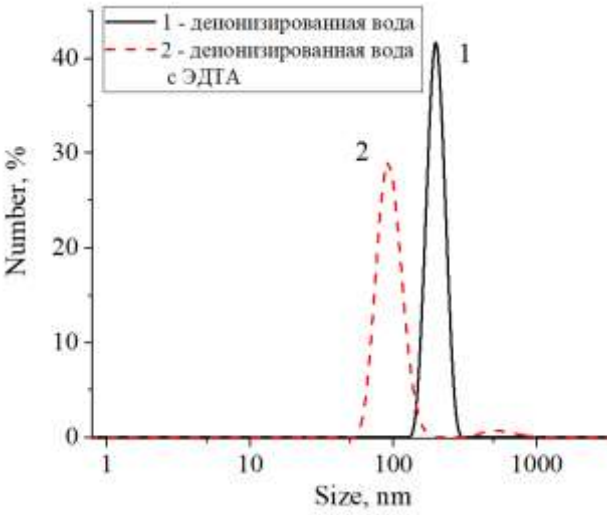
DOI: 10.34854/ICPAF.51.2024.1.1.197

OBTAINING NANOPARTICLES OF METAL OXIDES IN A MULTISPARK DISCHARGE WITH GAS INJECTION INTO THE INTERELECTRODE SPACE *)

[1]Moryakov I.V., [1,2]Gudkova V.V., [1,2]Rezaeva A.D., [1]Anpilov A.M., [1]Davydov A.M., [1]Zakletsky Z.A., [1]Taktakishvili I.M., [1]Borzosekov V.D., [1]Konchekov E.M., [1]Gusein-zade N.G.

[1]Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia
[2]Peoples' Friendship University of Russia named after Patrice Lumumba, Moscow, Russia

Recently, more and more active research has been carried out on the use of low-temperature plasma to produce various types of metal oxide nanoparticles. This is due to the fact that chemical technological solutions traditionally used in industry for the production of nanoparticles are often very expensive, hazardous to human health and environmentally polluting. This is due to the fact that chemical technological solutions traditionally used in industry for the production of nanoparticles are often very expensive, hazardous to human health and environmentally polluting. One of the possible alternatives is to use a spark discharge in a liquid with gas injection into the interelectrode space to synthesize metal nanoparticles[1]. The advantage of this method is that it does not require the use of expensive precursors, it only requires gas, water, electrodes and electricity.



Hydrodynamic radius of particles formed in deionized water (1) and EDTA water after 10 minutes of discharge treatment, measured using Zetasizer ULTRA. The injected gas is argon.

The paper presents research results demonstrating the possibility of using the proposed discharge system to produce metal oxide nanoparticles of various types and sizes in a liquid depending on the injected gas (argon, air), the initial liquid being processed (Milli-q deionized water and water with the addition of ethylenediaminetetraacetic acid) and solution processing time. The experiments used electrodes made of stainless steel 12X18H10T and duralumin alloy D16. Power source parameters: applied voltage U = 20 kV, high-voltage pulse repetition frequency f = 50 Hz, energy of the storage capacitor W = 1.6 J. The generation of nanoparticles occurs mainly due to sputtering of the electrode material.

The experimental results obtained will be in demand in the production of nanoparticles and their agglomerates with controlled parameters.

References

[1]. A.M. Anpilov, E.M. Barkhudarov, Yu.N. Kozlov, I.A. Kossy, M.A. Misakyan, I.V. Moryakov, M.I. Taktakishvili, N.M. Tarasova, S.M. Temchin, Plasma Physics, 45 (3), 268 (2019). DOI: 10.1134/S0367292119020016

*) abstracts of this report in Russian