A POSSIBILITY OF PLATINUM CATALYST SYNTHESIS IN A MICROWAVE subTHRESHOLD DISCHARGE [[1]](#footnote-1)\*)

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The GPI RAS (Moscow, Russia) is implementing a project for the synthesis of micro and nanoparticles with a controlled composition and structure based on a microwave discharge initiated by gyrotron radiation. The feature of this approach lies in the primary initiation of a discharge in the near-surface layer of a powders mixture at metal-dielectric contacts within the microwave beam. The interaction of powder particles with plasma leads to the evaporation of the substance, modification of the particle surface and the occurrence of plasma-chemical reactions. There is always a threshold for the intensity of microwave radiation, below which it is not possible to initiate the discharge. In order to ensure the interaction of particles of target powders with plasma even in the absence of breakdown at metal-dielectric contacts, an experimental configuration was proposed that is more typical for solving applied environmental and plasma-chemical problems [2]. Microwave radiation, not experiencing significant attenuation in the mixture of powders, hits the initiator, where local gas breakdowns occur, and a discharge begins to develop, propagating along the beam towards the radiation source. The gas temperature in the discharge reaches 6000 K, and the plasma density is 1017 cm-3. The results of the first experiments (Fig. 1) with a mixture of Al2O3 and Pt powders showed that the interaction of powder particles with the plasma of a subthreshold microwave gas discharge leads to the coating of carrier microparticles (Al2O3) with platinum nanoparticles. Such coated particles are similar to those used as catalysts in chemical manufacturing processes.

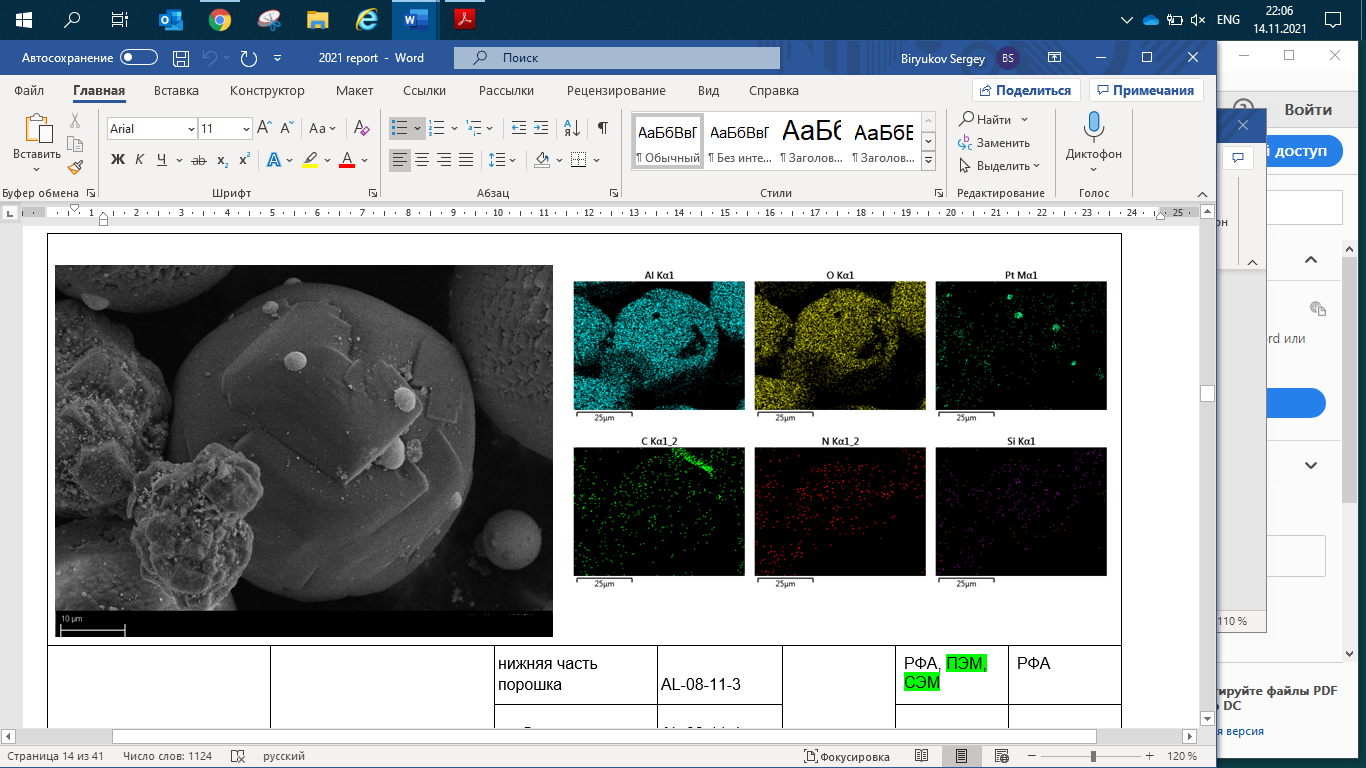


Fig.1. SEM image and material composition maps obtained with EDS analysis of the specimen Al2O3 + 2% Pt.

References

1. G.M. Batanov, I.A. Kossyi. Plasma Physics Reports, 2015, V. 41, N. 10, pp. 847–857.
2. K.V. Artem’ev et al. Plasma Physics Reports, 2018, V. 44, N. 6, pp. 615–625.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/GY-Borzosekov.docx) [↑](#footnote-ref-1)