Synthesis of platinum-group catalysts in plasma-chemical processes initiated by the radiation of a powerful pulsed gyrotron [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.007

Gusein-zade N.G.

Prokhorov General Physics Intstitute of the Russian Academy of Science, [ngus@mail.ru](mailto:ngus@mail.ru)

Pt / oxide support catalysts are one of the most common types of hydrogen transfer catalysts - hydrogenation and dehydrogenation processes. The search for new effective methods for the preparation and modification of Pt / oxide support catalysts remains an urgent task in view of the expanding application of hydrogenation and dehydrogenation processes in industry, in particular, for the transportation of hydrogen in the form of the so-called liquid organic hydrides. Another problem is a decrease in the activity of catalysts over time due to the deposition of carbon compounds on their surface, which requires the development of reactivation methods for decoking catalysts.

For the first time, ceramic microparticles (supports for catalysts) with deposited platinum (Pt) nanoparticles were created under the conditions of a plasma-chemical process, during its initiation by microwave radiation of a powerful pulsed gyrotron in mixtures of metal and dielectric powders (Pt / Al2O3, Pt / SiO2). Experiments on the dehydrogenation of nicloalkanes in the presence of the obtained samples showed the possibility of using them as catalysts. Figure 1 shows micrographs of oxide microparticles with platinum nanoparticles for samples obtained from mixtures of Al2O3 / Pt powders with platinum contents of 5 and 10 wt%. The possibility of reactivating spent Pt / Al2O3 catalysts using microwave radiation from a powerful pulsed gyrotron has been shown for the first time.

|  |  |
| --- | --- |
|  |  |

Figure 1 - Micrographs of oxide microparticles with platinum nanoparticles deposited on their surface for samples obtained from mixtures of Al2O3 / Pt powders with a platinum content of 5% and 10% by weight (right)

The work was carried out within the framework of the state assignment GZ BV10–2021 "Study of the innovative synthesis of micro- and nanoparticles with a controlled composition and structure based on a microwave discharge in gyrotron radiation".

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