special features in the analysis of the metal nanoparticle and low-density plastic layers developed for ICF targets [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.095

Gromov A.I., Akunets A.A., Borisenko N.G., Pastuhov A.V., Pervakov K.S.

Lebedev Physics Institute, Russian Academy of Sciences, Moscow, Russia, gromovai@lebedev.ru

The application of targets containing additional metal nanoparticles and low density deuterated plastic layers gives apossibility to solve a considerable amount of tasks in the ICF facilities: to improve the compression stability, to increase the conversion of laser radiation into the x-ray one, to increase the neutron yield, and for the diagnostic purposes as well. The free-standing layers of the indicated matters are being presently studied under laser irradiation for the verification of calculations and solution of practical tasks in the investigation of plasma, that is: an increase in the brightness of laser sources of particles and radiation, determination of the free paths, the creation of different conditions of plasma instability or stability, optimization of absorption and conversion of the input energy. In this work, from the entire variety of low-density plastics, the substances with a microstructure that could be the structural layers in the targets are analyzed. The measurements are accompanied by the experiments aimed at the decrease of the layer density.

The pains taking development of the manufacturing technology and control of such layers [1–3] led to the creation of the targets for laser experiments. The use of such layers and the results of experiments on their irradiation [4–6] required new measurements of the details of the structure and the target design in order to interpret the results and continue the research under new conditions.The thermostrengthening of the layers of metal nanoparticles [5] has been used morе widely for a more convenient transport and work in the chamber during the first seconds of pumping under a harp air pressure drop.The difficulties in the work with microquantitie soft substances used and the desired many changes in the density, the matter nanostructuring and its small need and studied a mounts, the space limit for manipulations, and, at last, the cost issues arise, and do not always find an easy solution in the work carried out.

The obtained results are important for the presently performed experiments and the future ICF research. This work was supported in part by the Russian Foundation for Basic Research (grants nos. 17-06-00366, 19-02-00875).

References

1. I.V. Akimova, N.G. Borisenko, A.I. Gromov, et al. ”Fabrication of effective low-density converter of intensive laser radiation to X-ray and novel measurement method of laser density from heavy metal nanoparticles.” J. Problems of atomic science and technology. Series Thermonuclear fusion, issue 2, p. 122–130 (2012) (in Russian)
2. L.A. Borisenko, I.V. Akimova, A.A. Akunets, et al.”Metal produced as nano-snow layers for converters of laser light into X-ray for indirect targets as intensive EUV sources” Journal of Radioanalytical and Nuclear Chemistry, vol. 299, no. 2, p. 955–960 (2014).
3. I.V. Akimova, A.A. Akunets, N.G. Borisenko, et al. ”Metal nano-particles modernized layers, including those with polymers, for laser thermonuclear fusion targets” Journal of Physics: Conference Series 907 012018 (2017).
4. N.G. Borisenko, Chaurasia L.J., et al. Comparison of laser light conversion efficiency into
X-rays in solid bismuth and in low-density bismuth. Preprint FIAN, № 29, 14 p. (2011).
5. I.V. Akimova, A.A. Akunets, N.G. Borisenko, A.I. Gromov, Yu.A. Merkuliev,
S.M. Tolokonnikov, “Strengthener layers of metal nanoparticles for ICF targets”,
XLV Zvenigorod Conference, April 2–6, 2018. Book of Abstracts, p. 147.
6. C. Kaur, S. Chaurasia, N.G. Borisenko, A.I. Gromov, A.A. Akunets, G.V.Sklizkov,
G.A. Vergunova and S.Y. Gus’kov, ”Demonstration of gold plasma as bright X-ray source and slow ion emitters”, Plasma Physics and Controlled Fusion, vol. 61, issue 8, 084001 (2019).
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/It/ru/DB-Gromov.docx) [↑](#footnote-ref-1)