NANOPOWDERS OF LUTETIUM OXIDE AND COMPACTS ON THEIR BASIS

N.A. Dulina, N.A. Matveevskaya, Y.V. Yermolayeva, R.P. Yavetskiy, Z.P. Sergienko, E.A. Vovk, A.V. Tolmachev

STC «Institute for Single Crystals» NASU, Kharkov, Ukraine
E-mail: dulina@isc.kharkov.ua

Recently object of steadfast attention of scientists became nanopowders of oxide rare earth elements, used for reception of optical ceramics. Interest to these materials is caused by prospect of their wide application in a science and technics as laser environments for powerful lasers, optical elements, transparent phosphors, magneto-optical materials.

The purpose of work was obtaining and research nanopowders of lutetium oxide. By the method of colloid synthesis in solution has been synthesized precursor, at further which temperature treatment have been received monodisperse, the spherical form nanoparticles in diameter 60-120 nm. The degree of dispersion of nanoparticles Lu_2O_3 does not exceed 10 %. The specific surface nanopowder Lu_2O_3, appreciated with the help of method BET, makes ~ 15 m^2/g. By a method of x-ray diffraction it is determined, that received oxide lutetium has cubic symmetry of a crystal lattice with the period 10,39 Å.

One of the major problems for obtaining dense optical nanoceramics is prevention of process of agglomeration nanoparticles which occurs at a stage of drying and annealing precursor. The lead researches on use of various methods of drying precursor (drying on air at room temperature, 60°C, 120°C; azeotropic distillation with use ethyl alcohol; lyophilization; microwave drying) have shown what to prevent agglomeration nanoparticals Lu_2O_3 it is possible at drying precursor on air at room temperature and at drying with the help azeotropic distillation. At the further annealing at temperature 700°C turn out not agglomerated nanopowders Lu_2O_3.

From isolated monodisperse nanoprticals Lu_2O_3 by colloidal pressure filtration and monoaxial pressing have been received homogeneous dense compacts. The density received compacts makes 45-52 %.